Towards effective conservation and governance of Pontocaspian biodiversity in the Black Sea region

Gogaladze, A.

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Synthesis: Towards effective conservation of threatened Pontocaspian biota in the Black Sea region

6.1 Introduction

The unique Pontocaspian (PC) biota of the Black Sea – Caspian Sea region, like many other biotas worldwide are in severe decline due to human development and interventions (CBD 2020). Current approaches to biodiversity conservation, especially when it comes to invertebrates, feature significant shortcomings and are not effective (Brechin et al. 2002; CBD 2020). Often, the lack of knowledge on species identities, distribution trends and ecology as well as the socio-political systems within which conservation is embedded provide major limitations to establish effective conservation regimes.

This thesis aims to contribute to the establishment of an effective PC biodiversity conservation regime in the Black Sea Basin (BSB) by answering scientific questions to set the research and policy agenda required for improving PC biodiversity data collection, promoting PC biodiversity awareness and establishing a meaningful conservation regime. Specifically, the thesis aims to answer the following research questions: 1) What are the current status and trends in PC invertebrate species and populations in the BSB? 2) What are the direct anthropogenic drivers of PC biodiversity change (either positive or negative)? 3) Are there areas in the BSB that can support viable PC populations today, that could be considered as priority areas in conservation planning? 4) What is the current legal and political framework to support PC biodiversity conservation in the Danube Delta - a prime PC biodiversity hotspot shared by Romania and Ukraine? 5) Who are the practitioners and stakeholders of PC biodiversity conservation in Romania and Ukraine? 6) How are the stakeholder networks arranged in Romania and Ukraine? 7) Are stakeholder institutional alignments optimal for PC biodiversity conservation in these neighboring countries? 8) What social variables, external to the stakeholder network properties help or hamper PC biodiversity conservation in Romania and Ukraine? The aim of this chapter is to reflect on the results of the previous chapters of this thesis and how they together may promote conservation actions aimed at PC biodiversity in Romania, Ukraine and surrounding areas of the BSB.

6.2 Scientific knowledge on the PC biota and habitats is inadequate

Scientific knowledge is the basis of effective conservation planning and management (Cash et al. 2003; Francis and Goodman 2010; Pullin and Knight 2001; Pullin et al. 2004) and newly assembled data show that this is inadequate. In chapter 2, ten regions in the BSB are identified, documented and mapped that contain 20th and/or 21st century occurrences of endemic PC mollusk species. They fall within Bulgarian (BU), Romanian (RO), Moldavian (MD), Ukrainian (UA), and Russian (RU) territories. The 10 regions are: 1) Bulgarian coastal lagoons and limans, 2) Lower Danube River (Fig. 2.6), 3) Danube Delta – Razim Lake System (Fig. 2.6), 4) Dniester Liman (Fig. 2.7), 5) Tiligul Liman (Fig. 2.8), 6) Berezan Liman (Fig. 2.8), 7) Dnieper-South Bug Estuary (Fig. 2.8), 8) Taganrog Bay – Don Delta (Fig. 2.9), 9) SE Azov Sea coast and 10) Tsimlyansk Reservoir (Fig. 2.9). A very strong decline of PC species and communities during the past century is evident in all the regions except for Taganrog Bay-Don Delta (8) and Tsimlyansk Reservoir (10). The observed decline is driven by 1) damming of rivers, 2) habitat modifications negatively affecting salinity gradients, 3) pollution and eutrophication, 4) invasive alien species and 5) climate change (chapter 2). Four out of these 10 regions contain the entire spectrum of optimal ecological conditions to support PC communities and still host threatened endemic PC species. These four regions are the Danube Delta – Razim Lake system (3), Dniester Liman (4), Dnieper-South Bug Estuary (7) and the Taganrog Bay-Don Delta (8), which we refer to as the 'optimum PC habitats'. More specifically, we define optimum PC habitats as waterbodies (lakes, estuaries, bays, river stretches) where at least one endemic PC species of two different families co-occur. This operational definition is based on mollusk species and will need expansion with representatives of other PC groups such as crustaceans and fish. Results of this study improve our understanding of PC biodiversity trends and will inform and greatly benefit future research. Furthermore, identification of optimum PC habitats is directly applicable for conservation planning as it will enable targeted PC biodiversity conservation actions.

One of the main limitations in assessing the status of PC invertebrate species is that for most of the PC groups (e.g., copepods, amphipods, decapods, gobies, etc.) no up-to-date taxonomic overview exists (but see Sands et al. 2020 for mollusk species; Wesselingh et al. 2019). Each taxonomic group within the PC invertebrate community, including the mollusks, contains disputed species (chapter 2). Pontocaspian invertebrate species groups often have few diagnostic characters, large morphological variability and wide autecological tolerances. Together with a fragmented institutional landscape, a taxonomic tradition of splitting single species into multiple species based on small differences and problems derived from applying various species concepts to geographically and ecologically separated biota has resulted in extensive synonymy (Wesselingh et al. 2019). Molecular techniques to establish the PC species boundaries has been applied only to few mollusk groups, e.g., Dreissenidae (Therriault et al. 2004), Monodacna colorata (Popa et al. 2011), Neritidae (Sands et al. 2020). In addition, the collection of living PC specimens is severely hampered by the demise of PC species. These factors together have led to a situation where knowledge on species distributions and abundances, population trends, life history traits, functional roles and sensitivity

to changes in the environment is lacking for almost all PC invertebrate species. Moreover, historical distribution data are often imprecise and also hampered by uncertainties in species identifications.

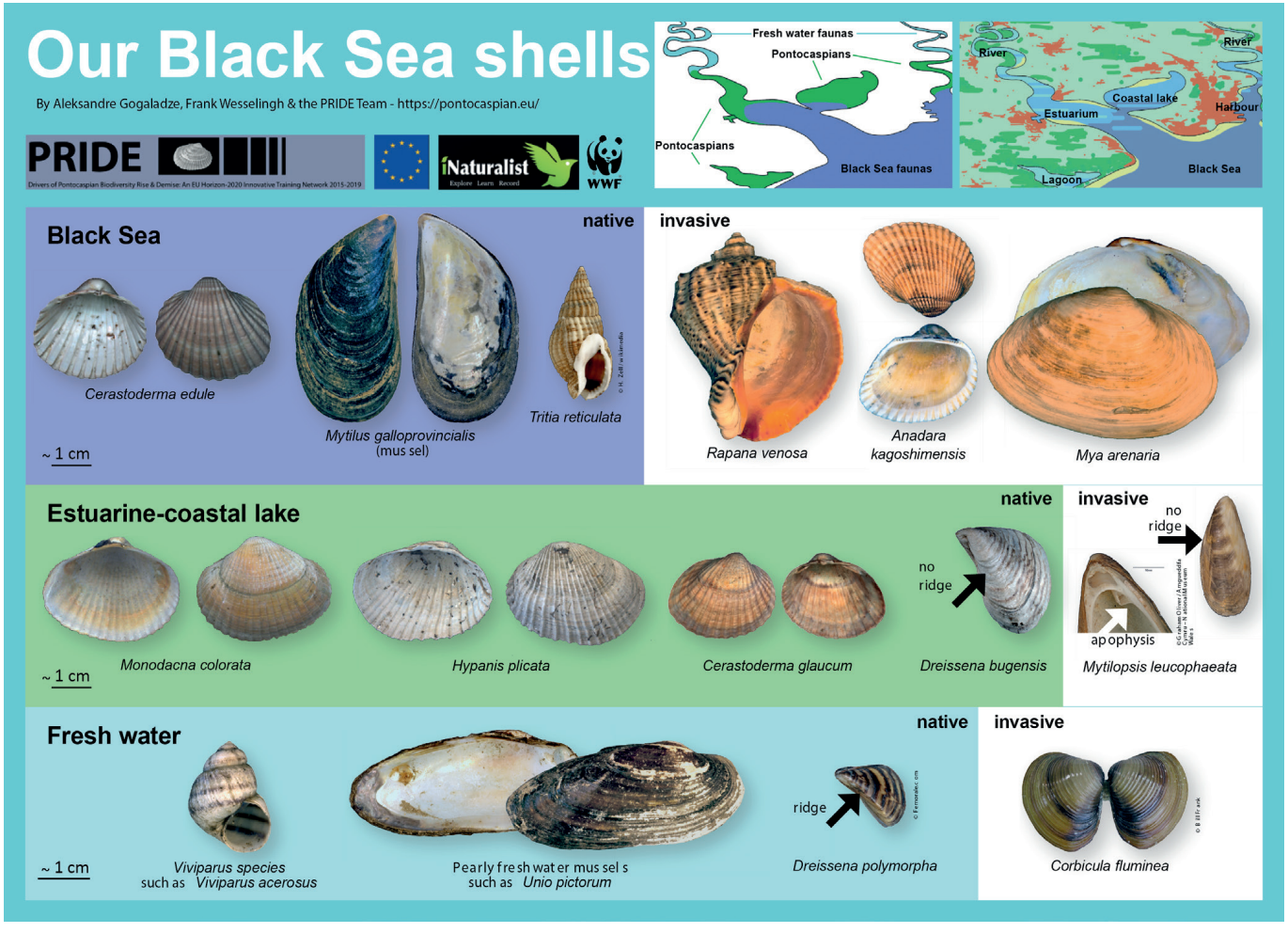
6.3 PC biodiversity can only be addressed by transnational cooperation

Identified PC habitats in the BSB cross national boundaries, and PC species and populations are currently managed by different legal arrangements, institutional designs and governance systems. In chapter 3 of this thesis the legal landscape that regulates the PC biodiversity conservation in the Danube Delta, a prime PC biodiversity hotspot shared by Romania and Ukraine, is defined and identified. Using a mix of quantitative and qualitative research methods we show that current legal arrangements do not provide sufficient protection to the PC invertebrate species. Specifically, we demonstrate that PC invertebrate species are underrepresented in global, EU and national Romanian and Ukrainian legal documents. PC habitats, which are characterized by specific salinity regimes, are not well classified and also underrepresented in international and national legal documents. Due to the great significance of Danube Delta as Europe's largest water purification system and an important wildlife area, most of the PC habitats are covered by the existing network of protected areas. However, for most of the protected areas the management plans are not in place. When in place, they do not address the PC biodiversity, providing incidental and therefore sub-optimal protection to the PC biota.

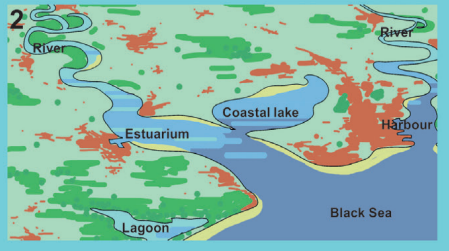
Legal coherence, that is the complementarity of action (mutual reinforcement), is important for effective and efficient transboundary conservation actions (Gomar et al. 2014). However, PC biodiversity related Romanian and Ukrainian national legislations are neither vertically coherent (i.e., coherent with global treaties and the EU Directives), nor horizontally coherent (i.e., coherent with each other). This hampers cross-border collaboration and effective PC biodiversity conservation action. For example, laws to regulate the management of Emerald sites in Ukraine are not yet into force, resulting in absence of management plans, while the analogous Natura 2000 sites have management plans in place (European Commission 2019). Furthermore, Laws and regulations that list the PC species and/or habitats need to be updated and amended according to the best available scientific knowledge to ensure consistency in the listed habitats and the species names. Finally, we concluded that sturgeons as surrogate species do not provide sufficient protection to the PC invertebrate communities because sturgeon habitats do not encompass the entire PC range. Even where sturgeons co-occur with invertebrate PC communities, the extent to which sturgeon conservation measures benefit the background invertebrate communities is unclear and requires further study.

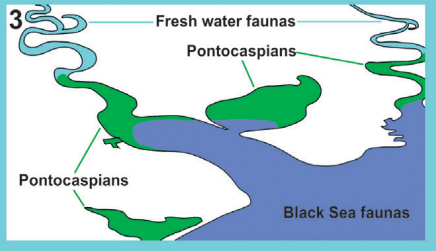
Our Social Network Analyses (SNA) of the stakeholder interactions (chapters 4 and 5) did not specifically address cross-border collaboration frameworks between Romania and Ukraine on topics related to PC biodiversity conservation. However, narratives showed that institutions in both countries are aware of each other and that some collaboration exists. The great significance of cross-border collaboration in the Danube Delta has been recognized by international conventions and the

Figure 6.1. Front and back pages of the PC mollusk species identification leaflet (English version). Romanian, Ukrainian and Russian versions are available online (https://pontocaspian.eu/).



Discover the unique mollusk fauna of the Black Sea





1 Our unique Black Sea shells

The Black Sea has a unique biodiversity including the endemic "Pontocaspian" mollusks. These Pontocaspian species evolved in low salinities of the Caspian and Black Seas over the past few million years. They occur nowhere else in the world! However, pollution, habitat destruction, climate change and invasive species are threatening these unique species. In order to improve conservation efforts we need more information on the distribution of the Pontocaspian species and the invasive species that threaten them. This is where we need your help.

2 What shells are we looking for?

Pontocaspian species are rare, they live in lakes, rivers and estuaries in the coastal zone where the salinities are low. In this leaflet you will find ways to distinguish the Pontocaspian species from freshwater and marine species and from invasive species that threaten them. These destructive invasive species have come from as far as the Caribbean!

3 What do shells tell us?

Shells can tell us a lot about the environmental conditions such as salinity, water movement and turbidity. They can also be used as indicators of pollution. Shells can be old. We are particularly interested in fresh shells so that we know environmental conditions and change in recent years.

4 You can help!

Are you going out to a local beach, harbor, estuary, lake or river? Take this leaflet with you! You can help us identify the presence of three Pontocaspian target species (*Monodacna colorata, Hypanis plicata, Dreissena bugensis*) and an invasive species (*Mytilopsis leucophaeata*) that is potentially harming our unique Pontocaspians. Your observations help us to detect where healthy populations are living and where invasive species are a threat. By reporting sighting and photos of these species we can protect our unique biodiversity of the Black Sea region!

5 How to report

We need fresh material from the four species, so we are looking for specimens that still have the two valves attached. Please take a picture of the shells, record locality information (preferably GPS coordinates), date and species name (if known). Repeat the above for each species at a locality. At home, you can upload the pictures and information to the i-Naturalist portal (**www.inaturalist.org**) sending it directly to our scientists.

6 Uploading observations using the iNaturalist app or website

Download and install the **iNaturalist app** on your smartphone. Create an account and sign in. To upload observations to the PRIDE project you have to join the iNaturalist "PRIDE" project. Open menu ➔ projects ➔ search for "PRIDE" ➔ Join. Now, observations can be added to the "PRIDE" project. Take a picture of the shell ➔ Add species name if known, leave blank if unknown; date and location will be added automatically ➔ go to Add to Project(s) ➔ select PRIDE and tap the check sign "✓"; now project has been selected ➔ tap the check sign "✓" once more to submit the picture to PRIDE.

For the iNaturalist website Go to <**www.iNaturalist.org**> and sign up. To add an observation go to <+Add observations> ➔ upload your picture ➔ fill in additional information under <Details>. Then go to the <Projects> tab ➔ type and select "PRIDE". If you only have one observation select <Submit 1 observation>. If you have several observations go to <+Add> tab in the top left corner ➔ select photo(s) ➔ a new window opens and you repeat the above procedure. Finally, submit your observations by selecting <Submit an observation>. With your contribution we are able to update the species distribution maps and identify conservation priority areas. Updated maps that include your observations will be posted on **www.pontocaspian.eu**

PRIDE

Drivers of Pontocaspian Biodiversity Rise & Demise: An EU Horizon-2020 Innovative Training Network 2015-2019

iNaturalist Explore Learn Record

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EU, which resulted in several collaborative projects (The World Bank study team 2014). Established programs relevant to PC biodiversity conservation in the Danube Delta are the cross-border cooperation program (within the European Neighborhood Instrument - https://www.euneighbours.eu/en) and the EU LIFE program. The former includes the "Black Sea", "Danube", and other bilateral or trilateral (including Moldova) ecological programs with considerable budgets. Usually in their formulations the term "Pontocaspian" does not exist, but these projects mainly concern the habitats of PC fauna (Danube Delta and Prut River, Lower Dniester and the Black Sea coastline of Ukraine, Romania and Bulgaria). The EU– 'LIFE for Danube Sturgeons' project (https://danube-sturgeons.org/the-project/) targets only the sturgeon species and for other PC taxa we did not find evidence for transnational collaboration.

During the EU-funded PRIDE project (http://www.pontocaspian.eu/) we collaborated with WWF in Ukraine to include PC biota in existing sturgeon related awareness raising activities for different coastal protected area administrations and local residents in Ukraine. Representatives of four coastal protected areas were trained as trainers in Kherson in August 2017, aiming to transfer knowledge and raise awareness of the unique PC biodiversity to the visitors of the protected area visitor centers (https://wwf.panda.org/?309051/ponto-kaspian-trip). Furthermore, students from Odessa Ecological University and Kherson Agricultural University, which were selected and trained by WWF in Ukraine as ambassadors of sturgeon conservation, the so-called 'sturgeon-watchers', received further training from PRIDE program on recognizing wider PC invertebrate taxa (https://danube-sturgeons.org/sturgeon_watchers_in-ukraine/). Later, 'Sturgeon-watchers', together with the PC biodiversity expert from NASU Institute of Marine Biology and the entire team from the National Nature Park "Tuzlovsky Limany" helped with interviewing 270 citizens in different villages of Ukraine, using a pre-developed, standardized questionnaire to measure the PC biodiversity awareness of general public (unpublished data). This same team and the WWF in Ukraine helped with the distribution of approximately 300 leaflets (Fig. 6.1) that were designed by PRIDE for raising PC biodiversity awareness through interactive citizen science. Additionally, 20 leaflets were included in the Black Sea Boxes in Ukraine (UN project aimed at raising environmental awareness in school students about the pressing Black Sea environmental problems). All these activities were conducted in Summer 2017 and it is important that such initiatives become systematic. Therefore, future projects that can extend the current organizational focus from flagship species to the entire PC biota in Romania and Ukraine are critically important. Such projects can be expected to raise awareness of the need of PC biodiversity conservation and incentivize the governmental and nongovernmental organizations to increase collaboration.

6.4 Low awareness of the PC biota impedes effective conservation

Effective planning and implementation of conservation programs, including those addressing PC biodiversity, is often limited by inadequate consideration of the social context in which conservation is embedded (Jarvis 2015). Understanding and accounting for the social systems

in the BSB is imperative to inform Pontocaspian biodiversity conservation planners and account for inherently complex and dynamic interactions between people and nature (see e.g. Crona et al. 2011). In chapters 4 and 5, we identify the relevant stakeholder organizations in Ukraine and Romania, which are involved in, or concerned about PC biodiversity conservation, and study their professional interactions. Identified stakeholder organizations represent academic, governmental and nongovernmental sectors, as well as the coastal protected area administrations.

PC biodiversity plays a minor and mostly an incidental role in the identified inter-organizational interactions in Ukraine and Romania, indicating low priority for PC biodiversity conservation. The few cases where PC biota is a direct target of interactions in Ukraine and Romania comprise sturgeon-related projects. Furthermore, even though we did not include a standard question on the definition of Pontocaspian species in the questionnaire, the network narratives showed that in both countries the interviewed stakeholders have different understanding on what Pontocaspian species and habitats comprise. This indicates low institutional awareness of PC biodiversity. Coupled with the low recognition of the need for PC biodiversity conservation on the policy level (chapter 3), this results in low interest of environmental organizations to collaborate on topics related to these taxa. Consequently, PC biodiversity is only marginally, or incidentally involved in organizational interactions, with the exception of sturgeons.

6.5 National institutional frameworks suffer from a range of social factors that hamper optimal functioning

The functioning of the stakeholders' social networks in Ukraine (Fig. 4.2) and Romania (Fig. 5.2) are hampered by social variables (Figs. 4.3 and 5.3), most notably the limited funding that is available (chapters 4 and 5). In Romania funding defines collaboration, i.e., collaboration and exchange of scientific information ceases as the funding stops. In Ukraine lack of funding does not have effect on exchange of information. Besides publicly funded projects, the EU LIFE Program is the major source for conservation funding in Romania (Hermoso et al. 2017). When EU funding is awarded to an organization in Romania, it becomes less interested in collaborating with other organizations in other projects. This is argued to result from the complexity to implement EU LIFE projects (Nita et al. 2016). Additionally, reduced exchange of information occurred in Romania due to institutional competition among stakeholders which encouraged organizations to keep data to themselves as a competitive advantage to attract future grants. In Ukraine, project-based collaboration on conservation of Pontocaspian biodiversity is limited, and the exchange of information occurs mostly due to organizational mandates or voluntary actions and supporting attitudes of organizations. However, to implement conservation policies additional funding is required.

Furthermore, institutional instability and hierarchical governance systems in Romania and the legal limitations in Ukraine obstruct optimal functioning of conservation networks to address PC biodiversity decline. Continuous institutional reform in the public sector in Romania was suggested to be a result of adjustments to the EU institutional structures, which may persist

in the coming years to ensure access to national funds for scientific research (Vasile 2013). The hierarchical governance system that we find in the PC network in Romania is in line with the findings of earlier research conducted by Manolache et al. (2017, 2018) who identified non-inclusive governance systems with low involvement of NGOs and private stakeholders in Natura 2000 governance networks. Contrary to our findings, Stringer and Paavola (2013) suggested that the accession to the EU has played a major role in transposing the environmental governance and biodiversity conservation practices towards more collaborative, inclusive systems in Romania. There, stakeholder engagement in conservation planning is often understood by the governmental organizations as intersectoral cooperation and engagement. This results in seeking collaboration with other governmental organizations and international actors rather than in collaboration with local organizations and NGOs, resulting in hierarchical governance systems (Kluvankova-Oravska et al. 2009; Stringer and Paavola 2013; Wesselink et al. 2011). Consequently, improvements may be expected as the EU institution and collaborative system of conservation governance matures in Romania. In Ukraine, we show that legal limitations obstruct the functioning of conservation networks, while in Romania it is not the case. Legal limitations refer to "uncoordinated action of regional administrations, and to some of the national laws that are contradictory and create confusion among conservation organizations" (Gogaladze et al. 2020b). As part of the European integration of Ukraine, significant progress has already been made in drafting new environmental laws and amending the existing laws to improve the biodiversity conservation framework (Ministry of Ecology and Natural Resources of Ukraine 2018). Refinement of the legal framework is an ongoing process and improvements can be expected in Ukraine as well.

Different social environments in Ukraine and Romania shape structurally different stakeholder networks to deal with PC biodiversity conservation challenges. Low institutional awareness of PC biodiversity is common in both countries, as is the minor role of PC biota in organizational interactions. However, the Ukrainian network is well connected and the connections are reciprocated, which means that organizations are open to receiving but also sharing the information with other organizations. In Romania, however, the network is not well connected and relationships are not reciprocated, especially when it comes to the governmental organizations. Furthermore, the Romanian network is decentralized, and the few stakeholders that are structurally well-positioned in the network lack incentives to utilize their favorable positions to initiate PC biodiversity related actions. The Ukrainian network is more centralized and central stakeholders utilize their favorable positions to mobilize information and resources, deliberate between different types of stakeholders, and coordinate research and conservation action (Table A4.2.2).

According to network theory (Crona and Bodin 2006; Fazey et al. 2013; Leavitt 1951), different types of network structures suit different conservation contexts and phases, and the suitability of structures as well as the network properties change over time (Bodin and Prell 2011). While social and political settings and larger governance architectures in Romania and Ukraine to deal with biodiversity conservation issues are different, in terms of PC biodiversity conservation it can be

argued that the two countries are in a similar, initial phase, in which PC biodiversity is recognized to be threatened and is partly included in different legal documents (see chapter 3, also see Akimov 2009; Cuttelod et al. 2011; Dumont et al. 1999), but is not yet part of conservation planning processes and implementation as it is absent from collaboration relations in both countries. If supplied with knowledge on PC biodiversity and the right incentives, in the initial phase of conservation a well-connected, centralized network in Ukraine, through engaging the central, powerful stakeholders (Crona and Bodin 2006; Olsson et al. 2004), is better placed to translate knowledge into effective conservation actions than the Romanian network. The latter network is decentralized with marginal involvement of governance actors and NGOs (chapter 5, Tables 2 and 4) which may hamper knowledge dissemination and translation into conservation actions.

6.6 How can we improve the PC biodiversity conservation, restoration and management?

Clearly, agreed taxonomy and improved knowledge on PC biodiversity (e.g., distribution of species and their ecological interactions) is the first necessary step towards effective conservation. Research on PC biodiversity has a long history in the BSB, but the novel transdisciplinary and cross-border research approaches to study different aspects of PC biota are in their infancy. A resolved taxonomic framework is essential to enable standardized inventories and establish conservation status of PC species through IUCN assessments. Teams of taxonomists need to be formed to solve species delimitations using all available approaches. Additionally, standardized quantitative analyses of PC species distribution is important to establish population trends for conservation practices such as those conducted by Son (2011a, 2011b, 2011c, 2011d, 2011e, 2011f); Son and Cioboiu (2011); Son et al. (2020) for PC mollusk species. Biodiversity surveys and monitoring should be standardized and ideally be repeated multinational efforts. Baseline data should be combined from quality controlled historical records and collections, but also from the use of borehole occurrences for taxa with a fossil record such as mollusks (see, e.g., Velde et al. 2019). Not only species diversity but also genetic diversity needs to be mapped and assessed. PC species often have patchy occurrences and the current decline may result in small, genetically depleted populations. Further degradation and fragmentation of suitable habitats will lead to genetically depauperate populations and increases the risk of extinction.

Once the taxonomy and ecological status of species has been assessed, the next step would be to promote common understanding and increased awareness on PC biodiversity among general public, conservation practitioners and policy makers. Research on stakeholder organization interactions in Ukraine and Romania showed that there is no common understanding on PC biodiversity among different stakeholders and that this biota has a very low priority in the conservation agenda. Consequently, conservation practitioners lack the incentives to participate in PC biodiversity conservation related actions. However, central, powerful stakeholders and broker organizations have been identified who have the potential to mobilize stakeholder networks and

quickly spread new knowledge and incentivize other stakeholders to participate in PC biodiversity conservation. Such central stakeholders can effectively utilize their favorable positions and act as brokers only if current funding schemes and legal and political frameworks are improved.

Current conservation networks and collaboration frameworks in the BSB provide opportunities for integrated, large-scale PC biodiversity conservation approaches. Sustainable management of the BSB including the coastal riverine ecosystems has a high priority for the European Union and the neighboring Black Sea countries. The Black Sea Synergy program, which was formally launched in Kiev in February 2008 and updated in June 2019, is part of the European Neighbourhood Policy aiming to develop regional cooperation around the Black Sea and is open to all Black Sea countries. It is an expression of the EU's commitment to the Black Sea region, which, building on existing schemes and regional organizations like the Black Sea Economic Cooperation (BSEC) and The Commission on the Protection of the Black Sea Against Pollution (an inter-governmental body established for implementation of the Bucharest Convention), supports the establishment of cooperation and partnerships in environmental, transport and energy sectors. Furthermore in 2017 'The Blue Growth Initiative for Research and Innovation in the Black Sea' has been launched by the European Commission (EC). Within this initiative the 'Burgas Vision Paper' (European Commission 2018) was produced as the key framework document for a shared vision of a productive, healthy, resilient, sustainable and better-valued Black Sea by 2030. In this paper a team of experts from all Black Sea countries, with the support of the EC developed a Strategic Research and Innovation Agenda (SRIA) that addresses the Black Sea biodiversity in its agenda and highlights the urgent need of its conservation and monitoring.

Some of the ongoing projects in the BSB, which are relevant to PC biodiversity are:

1) EU/UNDP project: Improving Environmental Monitoring in the Black Sea (https://oceanconference.un.org/commitments/?id=15806). This project aims to a) improve availability and sharing of marine environmental data from the national and joint regional monitoring programs aligned with the MSFD and WFD principles and the Black Sea Integrated Monitoring and Assessment Programme (BSIMAP); b) Support joint actions to reduce river and marine litter in the Black Sea basin; and c) Raise awareness on the key environmental issues and increase public involvement in the protection of the Black Sea.
2) Black Sea Connect (http://connect2blacksea.org/about-the-csa/), which is a EU Horizon 2020 coordination and support action (CSA) that coordinates the development and implementation of SRIA, based on the defined principles in the Burgas Vision Paper (European Commission 2018), links relevant stakeholder institutions and donor organizations and supports policy development, innovation and joint actions to promote to the development of the Blue Growth in the Black Sea.

3) HydroEcoNex project: Creating a system of innovative transboundary monitoring of the transformation of the Black Sea river ecosystems under the impact of hydropower development and climate change" (http://eco-tiras.org/191-new-project-hydroeconex) under the "Joint Operational Programme Black Sea Basin 2014-2020" (Ukraine, Moldova and Romania). The Overall objective of the project is the development of a unified system of innovative environmental monitoring for the provision with data and information essential in the transboundary and sustainable long-term monitoring of observed transformations in Black Sea Basin's river ecosystems, caused by hydropower operation under climate change. Hydropower construction that changes flow and salinity regimes is one of the key threats to PC biodiversity.

For more examples of Black Sea projects see http://connect2blacksea.org/black-sea-projects/.

Many of these projects do not include PC biodiversity in their provisions and framing, but they cover the PC habitats (transitional zones from freshwater to marine environments such as the Danube Delta, Lower Dniester and the Dnieper-South Bug Estuary). Full integration of native aquatic PC biodiversity in the ongoing and future initiatives is necessary for wholistic and sustainable management of the BSB and associated riverine ecosystems and biota. The abovementioned projects involve large-scale cross-border and multi-stakeholder interactions and collaboration frameworks. This is a venue that can serve as a necessary base for planning and launching effective, integrated PC biodiversity conservation measures. A common understanding of PC biodiversity and an increased scientific, social and political awareness is a necessary precondition for making such an integrated, multi-stakeholder and cross-border conservation effort successful.

In the context of recent approaches and developments, PC biodiversity can be expected to gain high visibility that will increase effective conservation approaches. The PRIDE program has brought together a large group of international experts and scientists on PC biodiversity and laid a foundation for future collaborations and joint research. Additionally, the program investigated effective outreach policies and reached out to different stakeholder groups in the BSB and the Caspian Sea Basin as well as western Europe. Now that the 'ice has finally been broken' stakeholders and end users working with PC biodiversity are more aware of their mutual interests and are coming together. In the context of EU's ever-increasing interest in biodiversity conservation (Black Sea biodiversity in particular), the newly established cross-border, cross-disciplinary PC biodiversity conservation networks have a lot to offer towards establishing an effective, transnational conservation regime for the unique and threatened PC biota.