

# Introduction

The European Union's Water Framework Directive (WFD), dealing with the conservation of water resources, introduced the term "transitional waters" to refer to aquatic ecosystems consisting of "*bodies of surface water in the vicinity of river mouths which are partly saline in character as a result of their proximity to coastal waters but which are substantially influenced by freshwater flows*". Transitional waters include a wide variety of ecosystems, such as estuaries, rias, fjords, fjards, coastal lagoons, bahiras, intermittently closing and open lakes and lagoons, river mouths, tidal creeks, deltas, salty ecosystems and salt pans. All of these ecosystems are characterised by the interaction between a freshwater force due to river flow and discharge, a sinusoidal marine force due to the tide, and an intermittent marine force due to wave action. The different relative strength of these three forces, together with coastal geomorphology, determines the variety of transitional water ecosystems and the internal habitat patchiness occurring in each transitional ecosystem type.

Due to their origin as the place where freshwater and seawater meet, the strength of the different forces and coastal geomorphology, transitional waters have a number of characteristics in common which make them highly valuable patches in the coastal landscape and impressive sites for cultural and naturalistic tourism. They also frequently have characteristics that are not found elsewhere. As a group of ecosystems, transitional waters are rich and sheltered habitats; they are very productive patches in the coastal landscape, supporting dense populations of birds and forming important habitat islands along migratory routes. They are also unique places for birdwatching.

Many of the birds colonising transitional waters eat fish, benefiting from the fact that transitional waters are ideal ecosystems for fish, particularly fish juveniles, which in these sheltered and highly productive waters find the conditions for optimal growth. Indeed, transitional waters are nursery habitats for many fish species, including species that are important for the fishing industry. Transitional waters also provide a number of less apparent, *hidden*, services in the coastal zone which are important for the functioning of the biosphere. They are unique places, where nitrogen compounds are reduced to molecular nitrogen and released back into the atmosphere, thus helping to maintain atmospheric composition over the last 400-500 million years. Transitional waters filter the freshwater inputs, protecting the coastal environment and marine life, and they are a reserve of biodiversity, maintaining freshwater, marine and brackish species in a very restricted space.

Birds are not the only vertebrates that benefit from the services supplied by transitional waters. Human societies have often developed around or inside transitional waters; Venice is a special case, but all Mediterranean coasts are dotted with human settlements linked to this ecosystem type. In many cases we also have historical records of past fishing activity and the importance of these ecosystems as a source of nutrient-rich trophic resources for human populations. Thus, transitional water

ecosystems are target sites for naturalist tourism but also unique places for cultural tourism, searching for early signs of human development. They have been the drivers of socio-economic development, and the evidence they provide of the 'responsible' behaviour of our ancestors shows us that real sustainability is both possible and necessary. Many transitional waters also have a number of distinct characteristics, depending on their origin and location in the coastal landscape.

Their characteristic flora and fauna can vary significantly from ecosystem to another. For example, the average similarity in the benthic invertebrates of Italian lagoons is less than 10%, suggesting two main conclusions: every lagoon has its own unique pattern of fauna, and biodiversity has to be protected at the EcoRegional level, since it is at this level that most biodiversity occurs. The transitional waters of Montenegro share these two general characteristics; they produce the typical services of transitional waters (and are thus highly valuable patches along the Montenegrin coasts), and they represent unique ecosystems within the Mediterranean coastal landscape.

Indeed, the coast of Montenegro has two major features which are not common to the rest of the Mediterranean coastal landscape: firstly it has high mountains very close to the sea, creating closed bays and marine gulfs; secondly, an impressively high freshwater discharge feeds the coastal environment, making these closed bays and gulfs brackish environments and thus real transitional waters. Boka Kotorska, the Kotor Gate, is the largest and most famous of these ecosystems along the coast of Montenegro, and is also one of the most attractive sites for tourists, given the combination of nature, culture and history. This combination is clearly not a product of chance but the organised result of humans living in symbiosis with ecosystems, taking advantage of their special features, as invertebrates, fish and birds still do. We can learn much by visiting a beautiful place like Kotor.

In this guide, the author takes us on a journey to some of the most beautiful transitional waters of the Montenegrin coast. As a scientist specialising in ecology, he tells us what keeps these ecosystems functioning despite changes over time in terms of species density and modifications made by human beings. However, he is also moved by a real passion for nature, and he shows us the beautiful world of migratory birds in Montenegrin transitional waters, especially saline ecosystems. He makes us feel as if we were actually visiting these ecosystems in person, yet leaves us with a strong desire to go there and see the place for real. Most of the pictures in the guide are by the author and they show us not only the places and species, but also the author's sense of love and respect for them, and in this sense he is an excellent guide for tourists.

Sustainability is a 'buzzword', since we learned somehow that we need to be sustainable; a journey through the transitional waters of the Mediterranean will show us in practice what sustainability is and what it requires, and as such for us is a journey into our future. We may yet become better inhabitants of our planet, but we have much to learn, and coastal Mediterranean lagoons are good teachers.

# Wood

Okvirna Direktiva za vode Evropske unije (WFD) koja ima za cilj zaštitu vodenih resursa nedavno je uvela termin „tranzicione ili prelazne vode” kako bi definisala vodene sisteme koji su *„površine pod vodom blizu rijeka koje mogu biti zaslanjene zbog blizine morske vode i koje su pod konstantnim uticajem dotoka slatke vode”*. Tranzicione vode uključuju širok spektar ekosistema kao što su zalivi, fjordovi, obalne lagune, otvorena i jezera bez direktnog kontakta sa drugim vodama, delte, slatine i solane. Sve ove ekosisteme karakteriše interakcija između slatke vode i rijeka koje plave sa morskom vodom i djelovanjem plime i talasa. Različiti odnosi djelovanja poplava, plime i udara morskih talasa a u sadejstvu sa geomorfologijom terena determinišu različite tipove tranzicionih vodenih ekosistema i daju poseban pečat ovim vodenim staništima koja se nalaze unutar kopna.

Na osnovu njihovog porijekla, na mjestima miješanja slatke i slane morske vode a pod uticajem različitih sila i obalne geomorfologije, tranzicione vode ispoljavaju svoje specifične karakteristike koje daju visoke vrijednosti obalnom pejzažu kao impresivna staništa za organizovanje kulturnog i eko turizma sa svim svojim osobenostima. Cijela grupa ekosistema tranzicionih voda su bogata staništa i dobra skloništa: to su vrlo produktivni obalni habitati koji okupljaju značajne populacije vodenih ptica i koje postaju vrlo važne stanice tokom seobe ptica i jedinstvena staništa za njihovo posmatranje. Mnoge ptičje vrste zauzimaju ove habitate da bi se hranile ribom, čime koriste velike mogućnosti tranzicionih voda kao idealnih ekosistema za život u vodi, posebno riblje mladi koja ih koristi kao dobra skloništa i hranilišta za svoj rast i razvoj.

Ove vode su uistinu odgajališta mnogim ribljim vrstama, uključujući i one koje se koriste u industriji za proizvodnju hrane i preradevina od ribe. Manje je poznato sa su ova staništa jako bitna za funkcionisanje cijele biosfere. Ovo su jedinstveni habitati u kojima se azotna jedinjenja transformišu u molekularni/gasni azot, čime se doprinosi konstantnom sastavu gasova atmosfere posljednjih 4-500 miliona godina. Tranzicione vode su filteri opterećenih slatkih voda koje štite obalnu prirodu i život u moru. To su jedinstveni rezervati biodiverziteta značajni za očuvanje brojnih slatkovodnih, brakičnih i morskih organizama. Ptice nijesu bile jedini kičmenjaci koji su koristili prednosti koje pružaju tranzicioni ekosistemi. I mi smo u punoj mjeri iskoristili njihove prednosti: razvoj ljudskog društva je koncentrisan na ili oko tranzicionih voda a grad Venecija je jedinstven primjer veze ljudskih naselja i ovakvih ekosistema. I ne samo ona, na cijelom Mediteranu ljudska naselja imaju veze sa ovim staništima.

Mnogo je primjera i istorijskih podataka da su ribarske aktivnosti vezane upravo za ovakve ekosisteme kao bogate izvore hrane za ljude. Dakle, tranzicioni vodeni ekosistemi su pogodno tlo za razvoj eko turizma ali i jedinstvena područja za razvoj kulturološkog turizma za one koji traže rane fakte o razvoju ljudskog društva kao vodećoj sili socio-ekonomskog razvoja i dokaze „odgovornog“ ponašanja naših predaka, koji istinsku održivost čine potrebom više nego mogućim ishodom.

Tranzicione vode imaju svoje osobenosti u zavisnosti od njihove izvornosti i položaja u obalnom regionu. Karakteristike flore i faune u ovim ekosistemima mogu znatno da variraju. Samo jedan primjer potvrđuje pravilo: prosječna sličnost faune beskičmenjaka koja se nalazi u mulju ovih ekosistema u italijanskim lagunama iznosi manje od 10%, što navodi na dva glavna zaključka: svaka laguna ima jedinstvenu faunu a zaštitu biodiverziteta treba provoditi na regionalnom nivou.

Tranzicione vode u Crnoj Gori dijele ove dvije generalne karakteristike: one predstavljaju jedinstvene i visoko vrijedne habitate ne samo na crnogorskoj već i na mediteranskoj obali i produkuju sve ono što karakteriše tranzicione vode. U stvari, crnogorska obala ima dvije bitne prednosti koje se ne srijeću u mediteranskom obalnom pejzažu: jedna je da su visoke planine vrlo blizu mora a druga da stvaraju zatvorene zalive u kojima se vrši impresivno miješanje slatko slane vode koje čine uvale sa pravom brakičnom vodom tipičnom za tranzicione ekosisteme.

Boka Kotorska je najveći i najpoznatiji ovakav ekosistem na crnogorskoj obali koji postaje jedan od najatraktivnijih turističkih destinacija za one koji povezuju prirodu, kulturu i istoriju, koji razumljivo nije proizvod slučajnosti već organizovan rezultat našeg života u okviru ekosistema, koji koristi njegove osobenosti s obzirom da beskičmenjaka, riba i ptica još uvijek ima dovoljno. O ovome se može više čuti i vidjeti ako se posjeti mjesto kakav je prelijepi grad Kotor.

U ovom vodiču, autor nas vodi u šetnju crnogorskom obalom Jadrana na najljepše ekosisteme tranzicionih voda. Kao naučnik ekolog, on će nam ispričati pravu biološku priču koja ove ekosisteme još uvijek održava u funkciji uprkos promjeni vrsta u vremenu, promjeni njihove gustine naseljenosti i naše zbijenosti koja takođe modifikuje ekosistememe. Kakobilo, on je opsjednut prirodom i pticama i povećće nas u prelijepi svijet selica Crne Gore koje koriste tranzicione ekosisteme na svojoj seobi, naročito solane. On nas vodi u posjetu ovim ekosistemima kao da smo stvarno tamo i stavlja nam do znanja da ih i sami moramo posjetiti.

Većinu fotografija u ovom vodiču napravio je sam autor i one nam pokazuju ne samo ljepotu staništa i vrsta već i njegov osjećaj ljubavi i poštovanja prema njima. On je vodič u vodiču za nas turiste u ovim prelijepim mjestima. Održivost je jedna od 'vrućih riječi', odkad smo na neki način naučili da trebamo biti održivi; šetnja po tranzicionim vodama Mediterana će nam pokazati što je u stvari održivost i što ona zahtijeva na putu za budućnost. Mi možemo imati drugu šansu da budemo bolji žitelji naše planete ali treba da učimo. Mediteranske lagune nam mogu biti dobri učitelji kako to da izvedemo.