



*The sea and seashore
of Montenegro*



Montenegro's coastline is 310 km long, and belongs to six municipalities: Herceg Novi, Kotor, Tivat, Budva, Bar and Ulcinj. The area along the coast (the coast in this sense being the area bathed by the highest wave during the worst storm), together with the ports, dikes, rocks, bathing places, springs, river mouths, channels connected to the sea, the sea floor and undersea area and the whole course of the Bojana River in Montenegrin territory are managed by one, state-owned company: "Morsko Dobro Crne Gore" (Montenegro Coastal Zone Authority). In Ulcinj, it covers a strip wider than 1 km. 8 islands and 6 shoals, 31 rocks and 4 cliffs, along with 25.6 km of the coastline, are the property of the Montenegro Coastal Zone.

There are 117 beaches on the Montenegrin Adriatic coast, with a total length of 73 km. The water quality of the 55 most attractive beaches during the summer season is class I or II. Only rarely, in some micro-locations, is it class III, i.e., not suitable for bathing. Pollution of sea water mainly comes from fecal waste.

COASTAL CLIMATE

July and August are the warmest months, with average daily temperatures above 30°C. Winters are warmer than in the hinterland: the minimum air temperature on the coast is on average 5°C.

The number of summer days on the coast, i.e., those with a maximum daily temperature of 25°C and above, is on average more than 110 a year (summer days have also been recorded during March). The maximum number of summer days is recorded in Tivat - 113.3 and the minimum is recorded in Bar - 97.4 days. There are on average 30 tropical days per year, when the maximum daily temperature reaches 30°C and above. There are 10 frosty days, when the minimum daily temperature goes below 0°C, on average per year, and they are recorded in the period December - March.

The sunshine record is good, with an average of 2,455 hours annually. Ulcinj, the southern-most town on the Montenegrin Adriatic coast, has 2,567 hours of sunshine and is the sunniest town in Montenegro. 40% of total annual sunshine on the coast is recorded in the summer months.

Crna Gora ima 310 km dugačku obalnu liniju sa šest opština koje na nju izlaze: Herceg Novi, Kotor, Tivat, Budva, Bar i Ulcinj. Područjem uz obalu (obala je u ovom smislu područje koje kvase najveći talasi za vrijeme najjačeg nevremena), kao i lukama, nasipima, hridima, kupalištima, izvorima, ušćima rijeka, kanalima spojenim sa morem, podmorjem i morskim dnom, kao i cijelim tokom rijeke Bojane na teritoriji Crne Gore gazduje jedno preduzeće u državnom vlasništvu - Morsko dobro Crne Gore. Ono u Ulcinju zahvata pojas širi od jednog kilometra. Morskom dobru pripada: osam ostrva i šest školja, 31 hrid i četiri grebena. Njihova obalna linija iznosi 25,6 km.

Ukupna dužina plaža na crnogorskoj obali Jadrana iznosi 73 km a njihov broj 117. Na najatraktivnijih 55 plaža, tokom ljetnje turističke posjete, voda je između I i II klase, rijetko, samo na mikrolokalitetima, ona prelazi u III klasu tj. u vodu koja nije za kupanje. Zagađenje morske vode potiče uglavnom od bakteriološkog opterećenja zbog fekalnog otpada.

KLIMA U PRIOBALJU

Jul i avgust su najtopliji mjeseci u godini sa dnevnom temperaturom iznad 30°C. Zime su toplije nego u unutrašnjosti: srednja minimalna temperatura vazduha na obali iznosi u prosjeku 5°C.

Ljetnjih dana, kada najviša dnevna temperatura dostigne 25°C i više, na primorju u prosjeku bude više od 110 godišnje (i tokom marta mjeseca registrovana je pojava ljetnjih dana). Najveći broj ljetnjih dana je u Tivtu: 113,3, a najmanji u Baru: 97,4 dana. Tropskih dana, kada najviša dnevna temperatura dostigne 30°C i više, na primorju u prosjeku godišnje ima oko 30. Tropski dani su registrovani uglavnom u junu, julu i avgustu. Mraznih dana, kada se najniža temperatura tokom 24 h spusti ispod 0°C, na primorju prosječno ima oko 10 godišnje, a javljaju se u periodu decembar - mart.

Insolacija je jaka, u prosjeku 2455 sati godišnje. Ulcinj, najjužniji grad na crnogorskoj obali Jadrana ima 2567 sunčanih sati i najosunčaniji je u Crnoj Gori. 40% ukupne godišnje insolacije na obali bilježi se tokom ljetnjih mjeseci.

SEA CHARACTERISTICS



The average annual sea temperature along the Montenegrin coast is 17.9°C. In the coolest period of the year, January - March, the average temperature is 12°C. In the warmest period, June - August, the average maximum temperature is 23°C. During the summer months, daily water temperatures can reach 30°C. The salinity of the sea water along the coast is on average 38.50‰, while in the open sea it reaches 39‰.

The sea colour 90% of the time is blue or blue-green depending on cloudiness, the nature of the sea floor and the vegetation along the coast. It changes only in the part of the shore which is influenced by the Bojana River where it is yellow-green to dark yellow. Water on the high seas of the southern Adriatic is characterized by deep indigo to dark blue. Sea currents in the Adriatic have a maximum speed of 42 cm/s (incoming current along the Montenegrin shore) to 88 cm/s (outgoing current along the Italian shore).

The transparency of the sea water along most of the inshore area of Montenegro reaches to the floor, except in the part exposed to the influence of the Bojana River. Transparency increases towards the high seas. Thus in the center of the aquatorium it reaches the maximum of 60 m. The deepest point of the Adriatic is off the coast of Montenegro, with a depth of 1,340 m.



Srednja godišnja temperatura mora uz Crnogorsko primorje je 17,9°C. Najhladniji period godine januar-mart ima srednju temperaturu oko 12°C. U najtoplijem periodu, jun-avgust, srednja maksimalna temperatura iznosi 23°C. Dnevne temperature vode tokom ljetnjih mjeseci dolaze i do 30-tog podioka. Salinitet morske vode uz obalu iznosi, u prosjeku, do 38,50‰, dok je na otvorenom moru i do 39‰.

Boja mora je u 90% slučajeva plava ili plavo-zelena, u zavisnosti od oblačnosti, prirode dna i vegetacije uz obalu. Mijenja se samo na dijelu obale koji je u području uticaja rijeke Bojane gdje je žuto-zelene do tamno žute boje. Izrazito modra do tamno plava boja karakteriče vode na pučini. Morske struje Jadrana imaju najveće brzine od 42 cm/s (ulazna struja, uz crnogorsku obalu) do 88 cm/s (izlazna struja, uz italijansku obalu).

Providnost mora na najvećem dijelu priobalja Crne Gore seže do dna, izuzev na dijelu izloženom uticaju rijeke Bojane. Prema pučini providnost se povećava, da bi u središnjem dijelu akvatorijuma dostigla najveće vrijednosti, do 60 m. Najveća dubina Jadrana se nalazi naspram obale Crne Gore i iznosi 1340 m.

The Montenegrin coast is rich in terrestrial waters. Montenegro in general, especially its southern part belonging to the Adriatic watershed, is one of the richest areas in the world in water. On average 604 m³/s of water flows from its territory. This amount of outflow is found on only 2-3% of the earth's surface. The Bojana River, with 640 m³/s at high water-level, is at the top of the scale in terms of its input to the Mediterranean, along with the Nile, Rhone and Po.

BIOMASS PRODUCTION

Unlike the central and northern Adriatic, where production of nutritious salts, primarily nitrates and phosphates, is larger and leads to larger production of plankton, the southern Adriatic is a medium-productive zone. Numerous factors influence the concentration of nutritious salts. The most important are the geomorphological features of the basin, sunshine, currents, winds, and the inflow of fresh-water from the continent.

It is estimated that the open sea of the southern Adriatic belongs to the A zone (primary production of 55 grC/m²/annually), coastal waters belong to the C zone while Boka Kotorska Bay and the area around the mouth of the Bojana River belong to the D zone (over 150 grC/m²/annually).

Marine flora and fauna depend directly and indirectly on the production of phyto- and zoo-plankton. Research by the Institute for Marine Biology in Kotor (Montenegro) has confirmed high amounts of primary production and saturation with phytoplankton biomass. This mainly consists of silicate alga belonging to the Nitzschia and Dinoflagelata orders. Copepoda account for 80% of the total zooplankton mass.

The highest amounts of zooplankton, an important nutrition factor for the majority of marine organisms in all stages of life, are reached in spring as a result of the mixture of open sea and coastal waters. The most numerous Copepoda species in the southern Adriatic is *Ctenocalanus vanus*, which is also the most common Adriatic species followed by *Centropages typicus* and *Temora stylifera*, together with numerous species of the Oithona order.

Područje Crnogorskog primorja je bogato kopnenim vodama. Crna Gora u cjelini, a posebno njen južni dio koji pripada Jadranskom slivu, spada među vodom najbogatija područja u svijetu. Sa njene teritorije otiče u prosjeku 604 m³/s vode. Ovoliko ili veće oticanje se u svijetu javlja na manje od 2-3 % površine kopna. Rijeka Bojana sa 640 m³/s pri visokom vodostaju je po izdašnosti koju daje mediteranskom moru na vrhu ljestvice, uz Nil, Ronu i Po.

PRODUKCIJA BIOMASE

Za razliku od srednjeg i sjevernog Jadrana, gdje je produkcija hranjivih soli, u prvom redu nitrata i fosfata veća i omogućava veću produkciju planktona, južni Jadran spada u srednje produktivne zone. Na koncentracije hranjivih soli utiču brojni faktori i među najvažnije se ubrajaju geomorfološke karakteristike basena, insolacija, struje, vjetrovi, kao i slatkovodne dotoke sa kopna.

Procjenjuje se da otvoreno more južnog Jadrana spada u zonu A (primarna produkcija 55 grC/m²/god), priobalne vode u zonu C (60 grC/m²/god), a Bokokotorski zaliv i područje oko ušća Bojane u zonu D (preko 150 grC/m²/god).

Flora i fauna mora zavise direktno ili indirektno od produkcije fito i zooplanktona. Istraživanjima Instituta za biologiju mora iz Kotora potvrđene su visoke vrijednosti primarne produkcije i zasićenje fitoplanktonskom biomasom. Nju uglavnom čine silikatne alge iz rodova *Nitzschia* i *Dinoflagelata*. Kad je u pitanju zooplankton, čine ga uglavnom *Copepoda*, koje čine 80 % ukupne mase zooplanktona.

Najveće vrijednosti zooplanktona, značajnog činioca ishrane većine morskih organizama u svim stadijumima dostižu se u proljeće kao rezultat miješanja vode otvorenog mora i priobalja. Među *Copepoda* južnog Jadrana najbrojnija vrsta je *Ctenocalanus vanus*. To je ujedno i najzastupljenija jadranska vrsta koju slijede *Centropages typicus* i *Temora stylifera*, te brojne vrste roda *Oithona*.



*Bio-resources
of the southern Adriatic*





The quantitative and qualitative composition of organisms used in food or other industries, such as fish, molluscs and crustaceans, is still on the level of assumptions. The only available data are collected by sea-bottom trawling (fishing). Based on this type of data, the structure in the sea is as follows: 37.3% Elasmobranchii (cartilaginous fish such as sharks, rays, etc), 59.1% Osteichthyes (bony fish), 3.5% molluscs (Cephalopoda, octopus, squid, etc,) and around 0.01% crustaceans (Crustacea, shrimps, lobsters, crabs, etc.).



Kvantitativno - kvalitativni sastav organizama koji se koriste u prehrambenoj ili nekoj drugoj industriji: ribe, mekušci, rakovi, i pored intenzivnih istraživanja, ostale su na nivou procjene. Jedini podaci dobijaju se povlačenjem koče po dnu mora. Stanje u moru na osnovu kočarenja je sljedeće: 37,3% morske divljači (*Chondrichthyes*, hrskavičave ribe, ajkule, raže...), 59,1% košljoriba (*Osteichthyes*), 3,5% glavonožaca (*Cephalopoda*) i oko 0,01 % rakova (*Crustacea*).

POPULATION

The proportion of the total population of Montenegro living in the coastal area is increasing. The coastal population is growing much faster than the population in other parts of the country, mainly due to migrations. The largest population growth, therefore the largest pressure on resources, is recorded in Budva. 70% of the coastal population lives within 1 km of the coastline, with 84.6 inhabitants per km². More than 95% of all weekend apartments are located within 5 km of the shore. This situation illustrates the enormous pressure on space.

TOURISM

According to data from the National Tourism Organization, during 2007 Montenegro hosted more than 1,150,000 tourists, with 1,000,500 foreigners, making 7,300,000 overnight stays. The highest number of tourists come from Serbia, 37%; the European Union accounts for 26% and Russia 12%. The revenue from tourism increased by 39% compared to 2006, while for 2008 the planned growth in the number of tourists is 10% and in revenue 14.5%. Considering that the majority of tourists are located on the 300 km of Montenegrin Adriatic coastline, and that their presence is intensified during summer, one can imagine the pressure on resources, coastline, sea and nature.



STANOVNIŠTVO

Udio stanovništva iz primorja u ukupnom stanovništvu države je u porastu. Primorska populacija raste znatno brže od populacija koje se nalaze u drugim krajevima Crne Gore, uglavnom zbog migracija. Najveći rast broja stanovnika a samim tim i pritisak na resurse bilježi grad Budva i Budvanska rivijera. U zoni do 1 km od obalne linije naseljeno je oko 70% svih stanovnika primorja sa 84,6 stanovnika po km². Više od 95% svih vikend stanova smješteno je u zoni do 5 km od obale. Ovakva situacija govori o enormnom pritisku na prostor.

TURIZAM

Prema podacima Nacionalne turističke organizacije, u Crnoj Gori je tokom 2007. godine boravilo više od 1.150.000 turista, od čega oko 1.000.500 stranaca, koji su ostvarili 7.300.000 noćenja. Najviše turista dolazi iz Srbije, 37%; Evropske Unije 26% i Rusije, 12%. Prihod od turizma porastao je u odnosu na 2006. godinu 39%, dok se za 2008. planira rast broja turista za 10% i prihoda za 14.5%. Ako se uzme u obzir da je najveći broj turista smješten na 300 km crnogorske obale Jadrana i da je njihovo prisustvo najintenzivnije tokom ljetnjih mjeseci, može se steći slika o pritisku na resurse, priobalje, more i prirodu.

