Geomorphological properties of the island of Hvar beaches (Croatia, Eastern Adriatic Coast)

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Beaches are sedimentary forms, situated at the land-sea contact formed of unconsolidated material which can range in size from sand up to cobbles and boulders. They are one of the most dynamic coastal forms and particularly sensitive to changes (natural and/or anthropogenic).

Geomorphological properties of the island of Hvar beaches were analyzed by means of field mapping, ortho-photo and GIS analysis. All the beaches have been mapped and measured at four different points in time by means of Ortho-photos from State Geodetic Administration (2011, 2014 and 2017) and HERE maps (2019). Larger beaches have been also measured in the field with a GPS receiver (from July 2018 until July 2019). GIS and statistical calculations and visualization were done in ArcGIS 10.4 software.

Hvar is the longest Croatian island with a length of 67.8 km, and the fourth in size with a surface of 297.4 km². Along its 254 km long coastline 247 beaches have been mapped which make up 3.8 % of total coastal length. The beaches are rather small relating generally to pocket beaches. Only 14.7 % of beaches are larger than 500 m² and 59.95 % are smaller than 200 m². According to the sediment size gravely beaches predominate with 95.5 %, while only 4.5 % relates to sand beaches.

This study revealed that on the island of Hvar four major morphological types of beaches can be distinguished: beaches formed in fan material at the gully mouth (82.6 %), beaches under the cliff (9.3 %), beaches formed in Aeolian deposits (4.45 %) and artificial or anthropogenic beaches (2.4 %). 1.2 % are undefined. The majority of beaches, 75%, are today under anthropogenic impact while only 25% is completely natural.

Along the eastern Adriatic coast most of the beaches are formed in torrential material derived from the land accumulated at the gully mouth. Here we revealed that this is also the case on the Island of Hvar (82.6 %). Those beaches are parts of a larger geomorphological system which links the backward drainage basin with the beach. Consequently, here we test if the surface of the beaches correlates with the surface of the drainage basins. Taking into account all the beaches of that morphological type (204 beaches) the correlation revealed to be rather low ($r^2=0.37$). However, taking into account only the beaches without any anthropogenic impacts the correlation becomes more significant ($r^2=0.64$). This probably points to the disturbing effects of the anthropogenic activity on beaches sediment budget of the island of Hvar.
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