

RESEARCH ARTICLE



Microbiological Pollution of Water in the Bay of Durrës

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ABSTRACT

Several microorganisms with human or animal origin can be the cause of the diseases transmitted through water (*microbiological effects*). The discharges of used waters, contaminated with pathogen microbes, constitute the main cause of the microbiological pollution of the water.

The objective of this study is the evaluation of the water microbiological status in Durrës bay, compared with the EEA resolution (European Environmental Agency), with a view of identifying the risk factors and the improvement of the water quality. The water quality assessment (bacterial charge) defined two indexes of the faecal pollution: *Fecale Coliform (Escherichia Coli FC)* and *Enterokokut Intestinal (Intestinal Entererococcus – IE)*. Regarding the presence of *e Escherichia Coli (FC)*, during the year 2014, there has been an improvement of the bathing water status along the Durres Bay; only 2 points out of 18 monitored result in a ‘bad’ status and only 3 points out of 18 monitored result in ‘not good’ status (EU Directive on bathing waters). Regarding the presence of *Intestinal Entererococcus (IE)* during the year 2014, are presented in a ‘bad’ status the Currila 2 and Zhiron beaches so as the beaches after the Plepa Canal, 7 out of 18 monitored points; are presented as ‘not good’ the beaches in 2 out of 18 monitored points. The pouring of untreated discharges in the sea constitutes a risk factor in the pollution level of Durrës Bay. The treatment of the polluted waters, before the discharge, is a necessity for the guarantee of the microbiological and chemical quality of the bathing water in Durres Bay.

Keywords: water, quality, pollution, analysis, samples, treatment.

1. Introduction

The control of the waters quality characteristics constitutes an essential element in resolving the different problems related with the administration of the hydric resources. The studies performed during the last year’s show that the bay, deltas and lagoons pollution are in a level of concern [9,11]. Because of the limited hydrodynamic, as environments with a relatively limited communication with the seas, they accumulate for a long time pollutants with different origins causing concerns in: biota, food chains, touristic activities, other economic activities (as the sailing itself). In very functional bays (such as Durrës Bay) the pollution problem becomes even more worrying because, for different reasons, are requested also the physical, chemical and biological parameters standards of the waters. [3,12]

In the Durrës Bay are identified 3 main sources of the pollution, from:

the portal activity, that even though completed with an aquarium, has a relation with the beach as a

whole, due to the mixture of the water column by contributing mainly in pollution with heavy metals and hydrocarbons the beach through sewage waters, diffused and also point ones agriculture activities/livestock that are particularly exercised in the lowland area of Kavaja.

Durrës Bay is very dynamic due to the activities developed in it. It contains the biggest port and beach in the country. In summer the population reaches 300 000 inhabitants.

In the beach area there are more than 1300 flats, which serve as summer houses, with a very complicated urban problematic. Given the concentration of the buildings and the contributions of the all the categories in the ecological balance of the Bay, the chemical-physical qualities and particularly microbiological qualities of its waters are so aggravated that every kind of investment for the pollutants control would have a high ‘productivity/efficiency’ and would improve sufficiently the water quality [6,7]

Several microorganisms with human or animal origin can be the cause of the diseases transmitted through water (*microbiological effects*). The

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poured directly or indirectly in beaches so as the purity of beaches from urban solid waste).

The evaluation of the microbiological charge of the coastal bathing waters.

The evaluation of waters quality (bacterial charge) was performed through the defining of two indexes of the faecal pollutions:

Fecale Coliform probablisht Escherichia Coli (FC)

Intestinal Enterococcus – IE.

For the determination, of the two bacteriological indicators in the bathing waters, are used the analytical methods according to ISO: Intestinal Enterococci (IE)- Method ISO 7899-1 and Escherichia Coli (FC), according to the method ISO 9308 - 3 of Membrane Filtration (MF). So, according to the defined methodic, the water bathing samples for analyses were taken in

compliance with the Decision of the Council of Ministers No. 797, date 29.09.2010 on the adoption of the hygiene-sanitary regulation “*On the administration of bathing waters quality*” in compliance with Directive 2006/7/EC, date 15 February 2006 “concerning the quality of bathing water”; annex V; “*Methodology of sample taking and microbiological analyses*”

The water samples were taken 30 centimetres under the water surface and in waters which are not less then 1 meter deep. The bottles/containers which were used for the bathing waters sample taking, before their usage they were sterilized in autoclave not less than 15 minutes in 121°C.

The bottle/container volume for the sample taking to analyse each parameter was not less that 250ml.

Table 1. The monitoring points for coastal bathing water quality and the geographical coordinates for each point

No. Stations	Sampling place	Coordinates System	
1	Currila 1 beach	N 41, 32 036 °	E 019,42 988 °
2	Currila 2 beach	N 41,31 891 °	E 019,43 188 °
3	Zhiron (Arragosta) beach	N 41,31 145 °	E 019,43 430 °
4	Dajlani Bridge	N 41,31 461 °	E 019,47 005 °
5	Filadelfia beach	N 41,31 301 °	E 019,47 620 °
6	Teuta beach	N 41,31 218 °	E 019,47 807 °
7	Gostivar beach	N 41,31 096 °	E 019,48 100 °
8	Hekurudha beach (Police)	N 41,30 713 °	E 019,48 717 °
9	Iliria (pista) beach	N 41,30 125 °	E 019,49 442 °
10	Tropikal	N 41,28 915 °	E 019,50 603 °
11	After Plepa Canal	N 41,28 461 °	E 019,50 959 °
12	Benilva beach	N 41,27 200 °	E 019,51 662 °
13	Xhardino Complex	N 41,26 406 °	E 019,51 877 °
14	Vjena	N 41. 25 677	E 019. 51 941
15	Vapori mbytur (wrecked steamboat)	N 41. 24 401	E 019. 51 738
16	Mak Albania	N 41. 23 299	E 019. 51 373
17	White bunker	N 41. 22 676	E 019. 51 093
18	Football pitch	N 41. 22 443	E 019. 50 936

3 Results and Discussion

Hygiene – Sanitary Inspection

The hygiene-sanitary evaluation for the Durres bay during the touristic season in 2014 is presented as follows:

In the area of Durres beach it still remains a problem the quality of the bathing waters in the area of Plepa, at Kavaja’s Rock.

It is worth to emphasise that it continues to be the same hygiene-sanitary situation during the year 2014, as the one in the years 2013 and 2012,

particularly the area at Plepa where it is discharged the high altitude waters canal of Shkallnuri, which not only collects the urban waters but also other high altitude waters. This area of the beach is still not connected with sewerage system and also with the pumping station constructed this year, which will send these waters to be treated in the Polluted Water Treatment Plant of Durres (PWTPD), is not operative. (See the photo below): It remains still the same situation with the previous years and another major problem, urban liquid discharged in the coastal bathing waters by the social services

subjects that operate in the touristic areas. This situation remains still problematic in the area of Kavaja's Rock, subjects which are not connected with sewerage system. Along the beach of Benilva was found a sewerage canal which passed across the grass and then passed and discharged in the sea.

In the Golem beach during the year 2014, compared to previous years, were being made notably improvements in the disciplining of the urban discharged waters in the sea but still not in full efficiency. To discipline the discharge of urban waters in Golemi beach, during the 2014 it is paved main magistral for delivering urban water towards the pumping stations of discharge, by mean of which will be performed the push of the waters towards the Polluted Waters Treatment Plant of Kavaja (PWTPK). But still this system is not made operational because there are missing the

connections of the main magistral with secondary and tertiary sewage, for which the constructions are continuing even after the touristic season of the year 2014.

For this reason, based on the results of the microbiological analyses, even during the year 2014, the beaches of this area result in a 'bad' and 'not good' status (Table 2 and 3)

So the urban discharges even during the year 2014 are discharged in sea without being treated, by causing a considerable microbiological pollution of the bathing waters, especially in the discharge points and in the areas close to them, to which are also referred the microbiological analyses which in most parts of the monitoring points have resulted in a high charge, particularly in the urban discharge points.

Table 2: Evaluation of Fecal Coliform probably *Escherichia Coli* (FC) for Durres Bay

Evaluation of Fecal Coliform probablisht <i>Escherichia Coli</i> (FC) for Durres bay (2012-2013-2014)				
No.	Monitoring point	2012	2013	2014
1	Currila 1 beach	Good	Bad	Very good
2	Currila 2 beach	Good	Bad	Good
3	Zhiron (Arragosta) beach	Bad	Bad	Bad
4	Dajlani Bridge	Good	Very good	Very good
5	Filadelfia beach	Very good	Very good	Very good
6	Teuta beach	Very good	Good	Good
7	Gostivar beach	Good	Very good	Good
8	Hekurudha beach (Police)	Not good	Very good	Good
9	Illiria (pista) beach	Good	Very good	Very good
10	Tropikal	Not good	Very good	Very good
11	After Plepa Canal	Bad	Bad	Bad
12	Benilva beach	Bad	Not good	Good
13	Xhardino Complex	Bad	Bad	Not good
14	Vjena	Bad	Bad	Not good
15	Vapori mbytur (wrecked steamboat)	Not good	Bad	Not good
16	Mak Albania	Very good	Not good	Good
17	White bunker	Very good	Good	Good
18	Football pitch	Very good	Very good	Good

The evaluation of the microbiological charge of coastal bathing waters

Regarding the presence of *Escherichia Coli* (FC) we can say that during the year 2014 (table 2) we have an improvement of the bathing waters quality status along the Durres Bay, where only 2 points out of 18 monitored result in a 'bad' status, where we need immediate measures and where it is categorically prohibited people bathing. Also

regarding the 'not good' status only 3 out of 18 monitored points result in such a status.

So in a wider perspective we can say that in 13 points out of 18 monitored the quality of the bathing waters is 'very good' and 'good' during the year 2014. Mainly these points are found from Currilat to the Plepa Canal, except the 'Zhiron beach' point which results still very polluted. This quality increase of the bathing waters in this area is

related with start of functioning of the Polluted Waters Treatment Plant of Durres (PWTPD) and the sewerage network in this area.

Whereas the area from Kanali i Plepave (Poplar Canal) till Vapor i Mbytur (wrecked steamboat) (close to the Golem Canal) has still serious problems regarding the presence of *Escherichia Coli (FC)* even during the year 2014, except of Benilva beach which has improvements compared to the years 2012 and 2013.

For the area from Mak Albania till Football Pitch (Fusha e Sportit) in Qerret, we can say that

we notice a reduced tendency of the waters quality, but still we remain on 'good' quality waters. This reduction tendency of the waters quality in this area is related with the increase of the constructions years after year and with the not good functioning of the sewerage system and the Urban Waters Treatment Plant of Kavaja, due to the fact that works are being carried out to increase the elaborating capacity of this plant.

Table 3: The Intestinal Entererococcus – IE evaluation for Durres Bay

The Intestinal Entererococcus – IE evaluation for Durres Bay (2012-2013-2014)				
No.	Monitoring point	2012	2013	2014
1	Currila 1 beach	Not good	Bad	Very good
2	Currila 2 beach	Not good	Bad	Bad
3	Zhiron beach (Arragosta)	Bad	Bad	Bad
4	Dajlani Bridge	Not good	Very good	Very good
5	Filadelfia beach	Very good	Good	Good
6	Teuta beach	Good	Good	Good
7	Gostivar beach	Good	Very good	Good
8	Hekurudha beach (Police)	Not good	Very good	Not good
9	Iliria (pista) beach	Not good	Very good	Good
10	Tropikal	Not good	Good	Good
11	After Plepa Canal	Bad	Bad	Bad
12	Benilva beach	Bad	Bad	Not good
13	Xhardino Complex	Bad	Bad	Bad
14	Vjena	Bad	Bad	Bad
15	Vapori mbytur (wrecked steamboat)	Bad	Bad	Bad
16	Mak Albania	Very good	Bad	Bad
17	White bunker	Very good	Good	Not good
18	Football pitch	Very good	Good	Good

Regarding the presence of *Intestinal Entererococcus (IE)* during the year 2014, are presented in a 'bad' status Currila 2 and Zhiron beaches so as the beaches after the Plepa Canal, 7 out of 18 monitored points; are presented as 'not good' 2 out of 18 monitored points (Table 3).

In a wider perspective we evaluate that in 13 points from 18 monitored, the bathing waters quality is 'very good' and 'good' during the year 2014; these

points are found from Currilat to the Plepa Canal, except of 'Zhiron beach' (Bryli) which still results very polluted; this situation is related with the start of the functioning of the Polluted Waters Treatment Plant of Durres (PWTPD) and the sewerage network in this area; the area from Plepa's Canal until Wrecked Steamboat (Vapori i Mbytur) (close to the Golem Canal) has still serious problems, it makes an exception Benilva beach which results better.

3. Conclusions

Urban discharges, according to the hygiene-sanitary evaluation for Durres Bay, continue to be discharged into the sea, without being treated, by causing a considerable microbiological pollution of the bathing waters.

In the Golem beach, the hygiene-sanitary evaluation for Durres Bay, year 2014, proves that are being made notable improvements in the water disciplining of urban discharges in the sea, but still not in full efficiency.

In the beach area at Plepa, as one of the most problematic points, the hygiene-sanitary evaluation for Durres Bay, year 2014, proves that this area of the beach (Plepat) is still not connected with e sewerage system so as the pumping station (build in 2014) is still not operational.

The microbiological analyses of Durres Bay beaches, in a considerable number, especially after the Plepa Canal, prove a **'bad'** and **'not good'** quality, compared with the standards (EU Directive for bathing waters).

Realetd to the presence of *Escherichia Coli* (FC), during the year 2014, there has been an improvement of the bathing waters quality status along the Durres Bay; only 2 out of 18 monitored points result in a **'bad'** status, and only 3 out of 18 monitored points result in a **'not good'** status.

Regarding the presence of *Intestinal Entererococcus* (IE) during the year 2014, are presented in a **'bad'** status Currila 2 and Zhiron beaches so as the beaches after the Plepa Canal, 7 out of 18 monitored points; are presented as **'not good'** the beaches in 2 out of 18 monitored points.

The pouring of untreated discharges in the sea constitutes a **risk factor** in the pollution level of Durres Bay.

4. Recomendation

The treatment of the polluted waters before the discharge is a necessity to guarantee the microbiological and chemical quality of bathing water in Durres bay.

5. References

1. Directive 2006/7/EC of the European Parliament and the Council of 15 February 2006 concerning the management of bathing water quality.
2. Hielm S., E. Hyytia, A.B. Andersin and H. Korkeala, **A high pevalence of clostridium batulinum type E in Finnish freshwater and Baltic**

- Sea sediment samples**, J. Appl. Microbiol., 1998, **84**(1), 133-137.
3. Kennish, M. J.. **Estuarine and Marine Pollution**. CRC Press, Boca Raton, FL, 1997, 524pp.
4. Lipp, E. K., R. Kurz, R. Vinsent, R. Rodrigues Palacios, S.R. Farrah an J.B. Rose, **The effect of seasonal variability and weather on faecal pollution and enteric pathogens in a subtropical eustaries**, 2001, **24**(2), 266-276.
5. Livingston, J. R. **Eutrophication processes in coastal system**, CRC Press LLC, 2001, 319pp.
6. Maestrini S. Y., D. J. Bonin, and M.R. Droop. **Test algae as indicator of sea water quality: prospect**. Academic Press. New York, 1984, pp. 131-188.
7. Papadakis, J. A., A. Mavridou, S.C. Richardson, M. Lambir and U. Marcelou, **Bather related microbial and yeast populations in sand and seawater**, Water Research, 1997, **31**(4), 799-804.
8. Rozen, Y. And S. Belkin, **Survival of enteric bacteria in seawater**, FEMS Microbiol. Review, 2001, **25**(5), 513-529.
9. Sabine Apitz, Andrea Barbanti, Alberta Bernstein, Marina Bocci, Eugenia Delaney and Laura Montobbio, **The assessment of sediment screening risk in Venice lagoon and the coastal areas using ISQG, ERFs**, 2007, Vol. 24, pp 128-141.
10. Smayda, T. J. **Harmful algal blooms. Their ecophysiology and general relevance to phytoplankton blooms in the sea**. Limnol. Oceanogr. 1997, **42**: 1137-1153.
11. The Bathing Water Directive. Council Directive 2006/7/EEC concerning the quality of bathing water (repealing Council Directive 76/160/EEC with effect from 31 December 2014)
12. Thornton J. A., J. McComb, and S. O. Ryding. **The role of sediments in Eutrophic Shallow Estuaries and Lagoons**. CRC Press. Boca Raton. FL. 1995. Pp. 205-224.
13. *Thurman, H. V. Introductory Oceanography. New Jersey, USA: Prentice Hall College, 1997, 434pp.*
14. Wait, D. A., and M.D. Sobsey, **Comparative survival of enteric viruses and bacteria in Atlantic Ocean seawater**. Wat. Sci. Technol., 2001, **43**(12), 139-142.