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Estimation of land-based pollution and waste loads in Hellonitis Bay, S-W. Greece

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The main aim of the investigation was to assess the overall environmental health of Hellonitis Bay, since it is considered a favourite holiday resort for many local and foreign tourists.

The sandy beach is about 10km. long and borders mostly on agricultural land, as well as tourist resorts, small villages and summer homes.

Since no data were available for the area, an inventory of potential land-based pollution sources was created in the first part of the study. The area investigated covered ca. 300km² and included about 25,000 inhabitants (locals) in 17 municipalities.
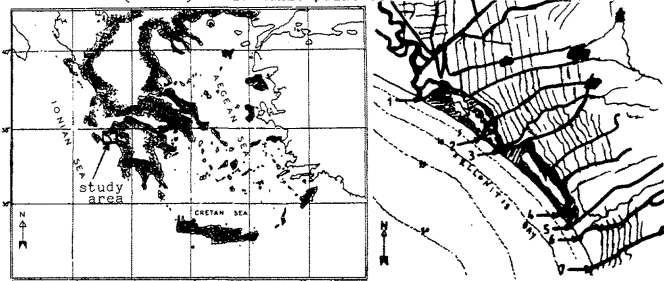
The second part consisted of chemical & microbiological measurements throughout a period of 1 year (March 1989-March 1990), on a regular basis (March-October every 10 days, October-March monthly).

METHODOLOGY: Microbial parameters (Total coliforms, E.Coli) were measured in sea water every 150m along the beach, 3-4m away from the coast at a depth of 1.5m, as well as in the main outlets (Fig.) of which Nos 1,3,7 are rivers and Nos 2,4,5,6 agricultural run-offs.
      Chemical parameters (NH_3, NO_2, NO_3, Total P, BOD, COD, dissolved oxygen and organophosphorus insecticides), were measured in all seven (7) outlets.

RESULTS: 1) All 7 outlets were shown to be polluted with microbes to a lesser or greater extent (No 1>4,5,6,7>>2,3). The microbial load increased during the summer months correlating well with the greater number of visitors to the area and thus indicating illegal sewage dumping. This, however, did not affect the sea, which continued to show no measurable pollution at most sampling stations, other than those close to the 7 outlets. Weather conditions (waves, wind etc.), however, do affect the microbial pollution of several areas of the beach.

MICROBIAL CONTAMINATION (X10^10 microbes/day)

No	MAY Tt.Colif	E.Coli	JUNE Tt.Colif	E.Coli	JULY Tt.Colif	E.Coli	AUGUST Tt.Colif	E.Coli	SEPTEMBER Tt.Colif	E.Coli	OCTOBER Tt.Colif	E.Coli
1	1,500	1,000	7,100	6,700	11,500	10,500	37,000	35,900	43,000	41,000	1,100	900
3	200	100	380	310	550	500	8,500	8,000	2,200	1,900	2,500	2,000
7	1,500	1,200	3,000	2,100	2,500	2,000	3,300	2,900	250	200	150	100
Σ2456	1,660	1,500	2,400	2,260	2,000	1,680	1,480	1,370	350	250	102	60

2) There is an increase (5x) of the organic load during the months of August and September (see Table), and river No 1 seems to be responsible for 97% of the total amount. Measurements on smaller streams leading into this river, have indicated that the increased organic load originates from tomatoe canning factories that operate at this time of year.

AVERAGE FLUXES (kg/day)

No	MAY BOD	Tot N	JUNE BOD	Tot N	JULY BOD	Tot N	AUGUST BOD	Tot N	SEPTEMBER BOD	Tot N	OCTOBER BOD	Tot N
1	3,800	290	5,500	850	3,000	930	33,000	1,600	34,000	2,000	14,000	7,000
3	340	87	770	126	560	110	170	50	155	25	490	30
7	390	52	320	48	340	40	44	10	-	-	55	12
Σ2456	370	75	660	100	580	77	60	6	-	-	-	-

CONCLUSIONS: The investigation clearly indicates that measures have to be taken in order to preserve the environmental health and stability of the coastal ecosystem.
      Thus it is proposed : i) To build a facultative lagoon that will receive the microbial and nutrient load of all outlets except No 1, since the flow and chemical parameter measures are small enough to be tackled by such facultative aerobic/anaerobic conditions and,
                            ii) Solve the problem of increased organic loads (No 1) and flows (12,000m³/day) by operating wastewater treatment plants in all the canning industry of the area.

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