3. Environment

The entire system of the Turkish Straits and the Sea of Marmara extends from the Aegean Sea to the Black Sea through the Dardanelles (60 km), the Sea of Marmara (210 km), and the Bosporus (31 km) [7].

The total length of the system thus is approx. 300 km because of the great differences in density between the waters of the Mediterranean and those of the Black Sea, there is a two-layered current system along the Sea of Marmara and the Turkish Straits, flowing in opposite directions [7].

The water masses of the Black Sea are entirely different from those of the Mediterranean proper. In the Black Sea, the combination of precipitation and runoff exceeds evaporation, and accordingly a surface layer of relatively low salinity and correspondingly low density is present [8].

Vertical mixing tends to reduce the density of the deeper surface layer (approx. 200 m), which therefore has a lower density than that of the water in the Aegean Sea at the same depth [9], [10], [11].

Owing to the distribution of density, the surface waters of the Black Sea flow through the Bosporus and the Dardanelles into the Aegean basin, and Mediterranean water flows in the other direction along the bottom.

The outflow from the Black Sea basin is a function of its water budget and carries runoff from the large rivers and other surface waters that flows into the Black Sea towards the Mediterranean [7].

The outflow also is a function of the excess of precipitation that has come down on the 423 000 km^2 surface of the Black Sea.

Intensive mixing takes place along the Bosporus as well as in the other parts of the straits. The salinity of the inflowing Mediterranean water, which is over 38.5‰Sal at the entrance of the Dardanelles, decreases slowly, with the distance travelled in the Sea of Marmara down to 29‰ Sal, where the bottom current enters the Black Sea at the northern end of the Bosporus.

At the same time, the salinity of the outflowing water increases from 16‰Sal to 30‰Sal when leaving the Dardanelles. This increase is a function of the distance travelled by the water.

The out- and inflowing water masses are separated by a well-defined layer of transition, which oscillates up and down according to the contours of the bottom.

This transition layer also represents the discontinuity layer for temperature and salinity and hence is called thermo-halocline, and is practically null below 200 m [7]. In other words, a Black Sea-originated water mass with a low salinity
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and a Mediterranean-originated water mass with.high salinity are located one over the other, in basins of 1000 m and deeper that are surrounded and limited by the shallow shelf areas.

The effect is a variable temperature of the surface water mass, fluctuating, dependent on meteorological conditions, between 6 and 29°C annually. In contrast, 14.2°C is the constant mean temperature of the water under the thermocline interface [7].

4. Results

Total 250 infected individuals of *Oikopleura (Vexillaria) dioica* were examined for presence of *Oodinium* spp. (Fig. 2. h) The mean number of *Oodinium* sp. on *O. (Vexillaria)dioica* individuals were **4.07**±*2.32*, with a maximum 11. (**mean nº** ± *st.dev*.).

The points of attachment of *Oodinium* sp. on *O. (Vexillaria) dioica* were: tail fin (mainly on the proximal side); trunk (mainly on the ovary section and on the stomach section respectively) (Fig. 2. a, b).

Percentage of the infected individuals of *O. (Vexillaria) dioica* was **13.7%**±*6.16* (**mean%**±*st.dev*), the sampling period and station based percentage of infected individuals to uninfected individuals are given in table 1.

Figure 2: (**a**) *Oodinium* sp. on *O. dioica* (**b**) *Oodinium* sp. on *O. dioica* detail.

Table 1: Date and station based distribution of the percentages of infected individuals to the non infected individuals. Mean values of 10 replicates of 1cm^3 from each station. (**%**±*st. dev.*) (**BC**) Beginning and (**EC**) Ending Coordinates of haul, Station Depth and (**HM**) Hauling Method (V; vertical, O; Oblique, H; horizontal)

Date	*Station nr*	*Depth (m)*	*BC*	*EC*	*HM*	*Total N° of Individuals*	*Infested Individuals (%)*
09/08/2007	36	41	40° 31.967' **N** / 026° 59.983' **E**	40° 31.900' **N** / 026° 59.850' **E**	H	*141*	**11.8**±*1.61*
05/08/2009	17	427	40° 40.617' **N** / 028° 33.933' **E**	40° 40.450' **N** / 028° 34.500' **E**	O	*98*	**13.9**±*1.51*
06/08/2009	24	45	40° 31.883' **N** / 027° 59.917' **E**		V	*112*	**23.1**±*2.10*
11/08/2009	40	1100	40° 48.233' **N** / 027° 27.550' **E**	40° 48.167' **N** / 027° 27.433' **E**	O	*75*	**7.9**±*1.56*
11/08/2010	17	455	40° 40.417' **N** / 028° 33.100' **E**	40° 40.167' **N** / 028° 32.283' **E**	O	*81*	**13.1**±*2.20*
06/08/2011	30	38	40° 21.900' **N** / 027° 42.983' **E**	40° 21.833' **N** / 027° 43.017' **E**	H	*136*	**4.8**±*1.41*
07/08/2011	40	800	40° 48.167' **N** / 027° 26.500' **E**	40° 48.200' **N** / 027° 25.500' **E**	O	*90*	**5.5**±*0.97*
07/08/2011	40	1000	40° 48.183' **N** / 027° 27.600' **E**	40° 47.733' **N** / 027° 26.667' **E**	O	*88*	**10.1**±*1.00*
07/08/2011	34	187	40° 54.233' **N** / 027° 33.633' **E**		V	*108*	**12.5**±*2.69*
08/08/2011	35	55	40° 28.750' **N** / 026° 59.533' **E**	40° 28.683' **N** / 026° 59.483' **E**	H	*144*	**16.2**±*1.25*
22/07/2012	19	59	40° 56.600' **N** / 028° 33.583' **E**		V	*132*	**17.9**±*2.79*
26/07/2012	3	1200	40° 42.400' **N** / 029° 04.350' **E**	40° 42.450' **N** / 029° 04.967' **E**	O	*107*	**16.4**±*3.80*
28/07/2012	26	44	40° 25.083' **N** / 028° 02.967' **E**		V	*131*	**24.5**±*2.39*

5. Discussion

During plankton surveys in Sea of Marmara, specimens of the appendicularian *Oikopleura dioica* infected with *Oodinium* spp. were collected. This study describes the parasitic attack of *Oodinium* spp. to appendicularia and the potential impacts, in case of the unique conditions of the Sea of Marmara.

This finding seems important, Appendicularians are important for the fishery of the area directly and via food web [12]. Capitanio et al. (1997) [13] also indicated that the appendicularia are important food for anchovy and anchovy is the most consummated and landed economically important fish species of the district. Any possible exponential negative impact that originated from the beginning of the food chain, will effect directly to the fishery economy of the area.

The enormous effects would arise by the spread of any kind of the Sea of Marmara sourced negativity, especially given that it merges Black Sea originated upper layer water mass with Mediterranean Sea through Aegean Sea and also Mediterranean Sea originated limited scale of water mass with Black Sea, as a conveyor.

Meanwhile the Sea of Marmara has been subjected to various human impacts that have led to changes in the ecology of this inland sea.

The main problem in the Sea of Marmara since 1980 is the growing pollution. All the settled areas around the Sea of Marmara are discharging the wastes using '**deep sea discharges**' directly under the pycnocline–thermocline layer in the Sea of Marmara, without any treatment [7].

In my opinion, the long term changing of the chemical environmental variables such as pH changes (Suppl. Data), increasing pesticide concentration [14] and/or increasing amounts of chlorine in the Sea of Marmara, that originated in large quantities as a result of the cleaning fouling organisms on the inside of the direct discharge pipes of sewage and power plants, discharged directly to the water column, are effecting to the hosts immunity and making them more susceptible to the parasitic attack; but this hypothesis requires further study.

The occurrence of a possible attack of the parasite *Oodinium* spp. to *O. (Vexillaria) dioica* is significant because the subject has high social and economic importance. Besides the direct affect of growing pollution, the uniqueness of the Sea of Marmara from oceanographical and geological point of view plays an important role for the social and economic structure of the area.

High probability of a fatal attack to the zooplankton communities will affect directly to the biodiversity via food web and finally to the fishery of the area.

The effect may grow or/and spread exponentially to the adjacent seas, because of the oceanographical and biological specialities of the Sea of Marmara and its connections trough Turkish straits.

It can be imagined the Sea of Marmara as a biological corridor between two totally different basins with different characteristics such as Black Sea and Mediterranean Sea.

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