

# Project P.O.N.D. – D A T A S H E E T



**Name of pond / lake:** *Vouliagmeni Lake*

**Location:** *Vouliagmeni, Attika, Greece*

**Description (Please use 3rd page for sketches):**

**Size & Depth:** *The lagoon is 260 m long and 145 m wide*

**Kind of water (fresh / salt):** *Brackish*

**Bottom:** *Mud. Deepest point in the middle of the open lake: 10m*

**Brief summary of history, use, state, etc.:** *Lake Vouliagmeni, situated 25 km south-east of the centre of Athens, was formed when the roof of an underground cave collapsed and flooded, after an earthquake occurred 2000 years ago (Chintiroglou et al., 1996). The lagoon covers a surface area of 4000 m<sup>2</sup> with a maximum depth of 13 m (Gontikaki et al., 2003). The 'western' part of the lake is a 30 m high rocky cliff. The lagoon is 260 m long and 145 m wide with an extensive underwater channel network, that reaches depths of 100 m. (Chintiroglou, Antoniadou, & Damianidis, 2008)*

*Lake Vouliagmeni ("Sunken Lake"), a small brackish water lake fed by underground currents seeping through the mass of Mount Hymettus. It was once a large cavern that collapsed following an earthquake, probably during the early middle Ages. The outline of the collapsed cavern roof can be clearly discerned from a distance. The lake stands at a 40 cm elevation, and its water maintains a constant 24 degrees Celsius temperature year round. It continues deep inside the mountain in an underwater cave never fully explored, as its end seems impossible to trace even by employing sonar detection. Many underwater expeditions have been carried out in order to chart it, and a few amateur divers have drowned trying. Because of its constant and comfortable water temperature, the lake functions as a year-round spa. (Wikipedia)*



Image 1: Aerial photo of the Lake. (Source Google Earth)



Image 2: View of the lake from the facilities

**Flora: (species / amount / location & concentration in water)**

*Mainly two species observed. Classification is pending.*

**Fauna: (species, amount)**

*Cerastoderma glaucum*

*Paranemonia vouliagmeniensis*

*Garra rufa*

*Mollies sp. (Poecilia vivipara)*

*Cerastoderma glaucum*



## Water Sampling and Analysis

### **Sampling Stations and Points**

Five different sampling stations were selected. Sampling points were preselected based on visual differences in geological substance and water currents. Stations have available marking for further future reference and samplings.

**Station 1:** One surface point (S) from the edge of the lake was selected. This area is likely infected by human actions during the whole year.

**Station 2:** One underwater point close to Parking Cavern area (P) at depth of 15,5 m has been selected. At this point it is possible to have interference with external environment. This is the area of multiple fish breeding.

**Station 3:** Two underwater points close to Lake Centre (L) at the depth of 5m and 10m were selected. This represents the median of the lake.

**Station 4:** One underwater point has been selected inside the Cavern Dome (C) at depth of 25m.

**Station 5:** One underwater point has been selected from the sub-lake (SL) at depth of 13m.

## Water Sample Chemical Analysis

### **Methodology of Sample Collection**

Water samples were collected at all four stations using 50ml sterile syringes (Kessler). At each point divers collected 3 different samples of water for analysis. Syringes were pre-marked and distributed to divers during briefing, according to divers' allocation. Participating divers were spited in 3 groups.

Group A: Anastasia Tentoma, Christina Loukidou, Melina Tsaila (**Station 1, 3**)

Group B: Alexandros Martinos, Miltiadis Giannou, Spyros Kollas (**Station 2,4**)

Group C: Giorgos Kolikis, Nikolaos Margaritis, Kostas Gouliaditis (**Station 5**)

### **Methodology of Sample Analysis**

Water samples were analyzed for pH, KH, NO<sub>2</sub>, NO<sub>3</sub> immediately after the dive. The following typical aquarium tests were used for analytical purposes:

- Salifert KH/Alk test: Measures in sufficient small steps of 0.1 meq/L or 0.3 dKH with a sharp color change.
- Salifert Nitrate (NO<sub>3</sub>) test: The range spans from very low to a very high nitrate concentration (approx. 0.05 – 20 mg/L as Nitrate-Nitrogen or 0.2 – 100 mg/L as nitrate ion).
- Salifert Nitrite (NO<sub>2</sub>) test: The range spans from very low to a very high nitrite concentration (approx. 0.01 – 4 mg/L).
- Sera pH Test: Range of analysis is 4,5 – 9,0 with sharp color change every 0,5



Image 3: Ammonia NH<sub>3</sub> – Test during actual measurement.

**Water parameters:** *pH, KH, NO<sub>2</sub><sup>-</sup>, NO<sub>3</sub><sup>-</sup>,*

**Thermo cline(s) at:** *Cavern: 25m / Sub lake: 9m*

Point	Depth (m)	pH	Salinity	O <sub>2</sub> (ppm)	NO <sub>2</sub> (ppm)	NO <sub>3</sub> (ppm)	KH (°dKH)	PO <sub>4</sub> (ppm)	SiO <sub>2</sub> (ppm)	Fe (ppm)
S	0	8	1014	4	0	25	4	0.25	0	0
P	15,5	8	1017	4	0	5	17	0.5	0	0
L1	5	8	1015	4	0	5	2	0.25	0	0
L2	10	7.5	1015	4	0	25	4	0.25	0	0
C	25	7.5	1019	4	0	5	15	0.5	0	0
SL	13	7	1017	4	0	5	11	0.25	0	0

**Findings:**

1. *Water chemistry and physical parameters varies in the lake.*
2. *There are also differences in fish population across the lake.*

**Remarks:**

*Water chemistry tests provided unreliable results for KH, NO<sub>2</sub>, NO<sub>3</sub>. Retest required for KH (higher sensitivity), NO<sub>2</sub> (higher sensitivity) NO<sub>3</sub> (lower sensitivity).*

**Pictures – please add separately:**

**Video – please add separately:**

**Project Leader:**

*Giorgos Kolikis*

**Diver(s):**

*George Kolikis (Tec 65 - BoE+),  
Anastasia Tentoma(Tec 45 - BOE)  
Kostas Gouliaditis(BOE)*

**Photographer:**

*Thodoris Pistiolas(AOW - BOE)*

**Cameramen:**

*Giorgos Kolikis  
Kostas Gouliaditis  
Nikolaos Margaritis  
Spyros Kollas*

**Assistance & Support:**

*Nikolaos Margaritis(BOE - ISE SM)  
Alexandros Martinos(TEC TRIMIX)  
Miltiadis Giannou(AOW - CAVERN)  
Christina Loukidou(AOW)  
Melina Tsaila(AOW)*

**Coordinator:**

*Spyros Kollas (Instructor)*

**Owner of water: Iamatika Loutra Vouliagmenis S.A.  
Person or Institution that gave permission: Iamatika Loutra Vouliagmenis S.A.  
Presented : Iamatika Loutra Vouliagmenis S.A. & ISE Greece meeting**

**Bibliography**

Chintiroglou, C., Antoniadou, C., & Damianidis, P. (2008). Spatio-temporal variability of zoobenthic communities in a tectonic lagoon (Lake Vouliagmeni, Attika, Greece). *Journal of the Marine Biological Association of the United Kingdom*, 5 (88), 873–881.

*Athens, Greece / 2 Nov 2014*

Signature of Project Leader