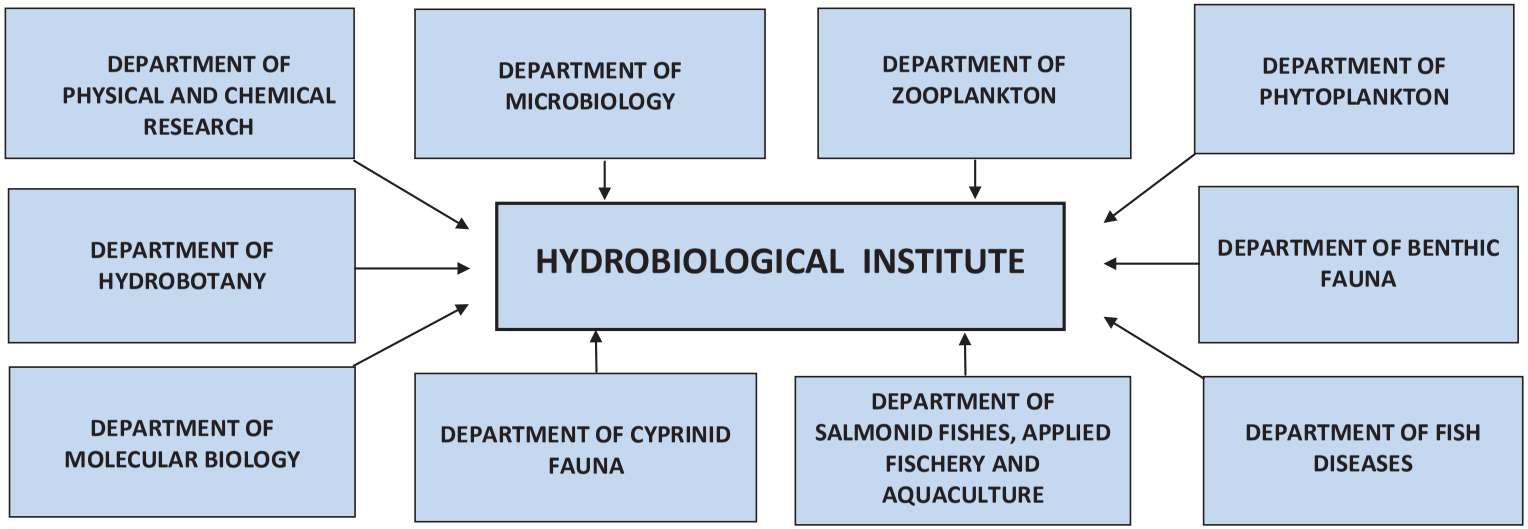
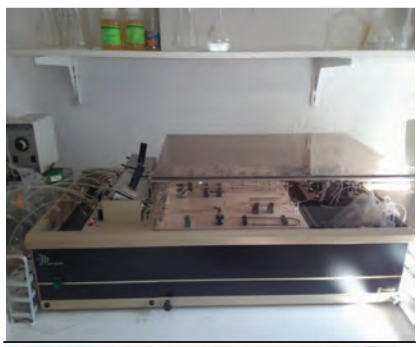
DETAILED DESCRIPTION
of the
DEPARTMENTS
at the
PSI HYDROBIOLOGICAL INSTITUTE
Ohrid

DETAILED DESCRIPTION
of the
DEPARTMENTS
at the
PSI HYDROBIOLOGICAL INSTITUTE
Ohrid

ORGANIGRAM OF THE PSI HYDROBIOLOGICAL INSTITUTE, OHRID





1. DEPARTMENT OF PHYSICAL AND CHEMICAL RESEARCH

Dr. Elizabeta Veljanoska Sarafiloska
elizabetasarafiloska@yahoo.com
elizabetasarafiloska@hio.edu.mk

Short description of the Department and its purpose

The Department of Physical and Chemical Research studies the physical and chemical characteristics of freshwater ecosystems (natural lakes, rivers, reservoirs), fishponds, groundwater, wastewater, drinking water, etc.

- Based on Physical and Chemical parameters, the concentrations of total nitrogen and phosphorus, as well as organic biodegradable substances, we determine the quality of water in the littoral and pelagic zone of Ohrid, Prespa, and Dojran Lake, determining the trophic status of aquatic ecosystems.
- We determine the organic and nutrient load of surface flows as recipients of waste industrial and communal waters, water from households, and drainage waters from the surrounding agrarian areas where these rivers migrate.
- Water quality and anthropogenic impact are assessed in the artificial reservoirs in the republic.
- Regular control of the water quality in the fish farms in the Republic of Macedonia is carried out.

Equipment in the Department

- Spectrophotometer (UV-VIS Zeiss-Jena, Specord S-10)
- Gas chromatograph (GC / ECD GS-3800 and Varian GS / MS system, Saturn 2100)
- Atomic absorption spectroscopy Varian SpectrAA 220
- HPLC liquid chromatograph
- TOC / DOC analyzer
- Microwave oven Milestone Microwave laboratory systems (Ethos touch control)
- Four-channel auto analyser Skalar
- Analyser for nitrogen compounds in sediment (Kjeldahl - digestion) Velp
- Analytical and Technical scale
- Ultrasonic bathroom and Water bath
- Drying and grilling furnace, centrifuge
- Water meter, pH meter, conductometer, thermometer, turbidimeter
- System for ultra clean water

What scientific research and application projects can the Department perform?

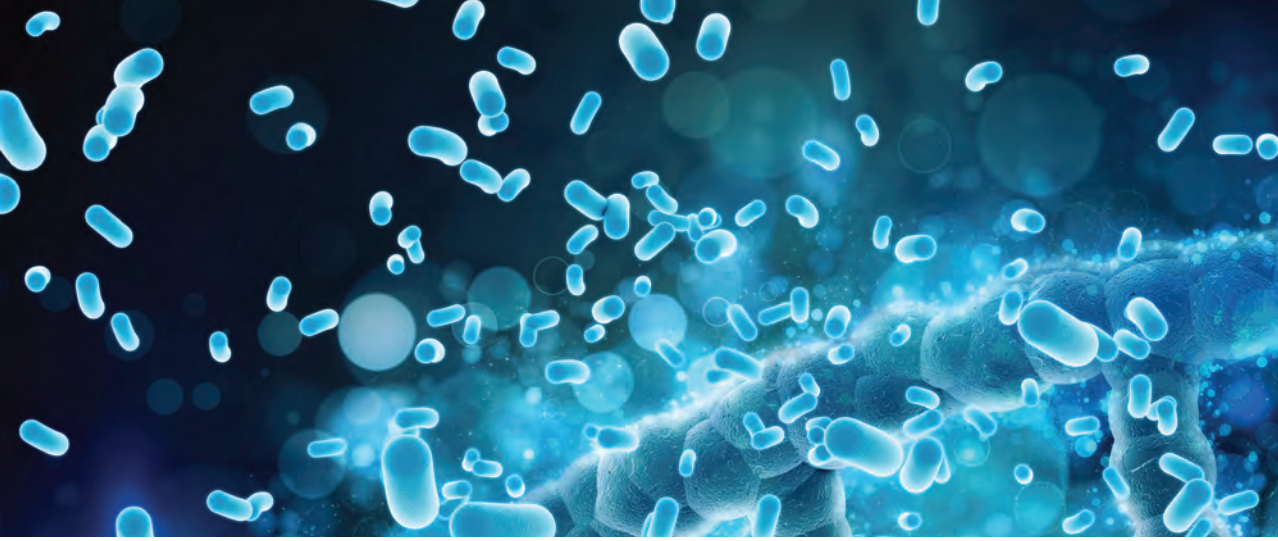
Surface water and sediment represent an extremely complex system consisting of substances that have reached them naturally and as a result of anthropogenic influence. Numerous physical and chemical and biochemical processes largely influence the distribution of matter in the sediment-water system, determine the forms of their finding, behaviour, and destiny.

The sediment serves as a habitat for the benthic living world (insects, shells, shrimp, which are usually food for fish) as a source and mechanism for removing certain contaminants into and from the water ecosystem and as a carrier of contaminants in ecosystems. By analysing contaminants in sediments and aquatic life, an efficient way of detecting the presence of toxic components in the aquatic ecosystem is provided.

The high sensitivity of fish fauna to chemical substances, that evolves, it is often used as an indicator of the degree of water pollution.

Given the fact that the quality of groundwater is seriously threatened recently as a result of irrigation in the dry period and the use of water from the wells, continuous monitoring of groundwater in terms of water quality and the quantity of groundwater utilization is necessary. The monitoring involves examining the quality of groundwater based on physico-chemical and biological parameters, primarily microbiological analyses and based on the Decree on the classification of groundwater, the class in which the waters belong.

- Monitoring the status of water quality in all aquatic ecosystems in Macedonia (springs, rivers, groundwater, natural lakes, reservoirs, wetlands, etc.)
- Determination of the trophic status of aquatic ecosystems (lakes, accumulations) based on the concentration of total phosphorus and transparency by applying mathematical calculations to the Carlson trophic index.
- Quantitative and qualitative determination of persistent organic pollutants (POPs) present in different matrixes (water, sediment, plant and animal tissue)
- Determination of organic and nutrient load on aquatic ecosystems
- Determination of individual physical and chemical parameters in sample sediment collected from aquatic ecosystems (pH,% of moisture in the sediment,% of organic matter, etc.).
- Analysis of samples of atmospheric water (rainwater) based on physical and chemical parameters (basic physical-chemical parameters, nutrients, oxygen parameters, and organic biodegradable substances)



2. DEPARTMENT OF MICROBIOLOGY

Dr. Lence Lokoska *- lokoskalence@yahoo.com*

Short description of the Department and its purpose

Microbiological analyses from the sanitary and ecological aspect of all types of natural and wastewater (lakes, rivers, reservoirs, springs, fishponds, etc.)

- water for drinking
- bathing water
- for irrigation
- communal wastewater
- industrial wastewater
- Analysis of sediments
- Analysis of food and beverages, fish food, etc.
- Analysis of fish diseases

Equipment in the Department:

- dryers
- sterilizers
- Incubators for the development of microorganisms
- a filter device
- autoclave

- microscopes,
- binoculars and magnifiers for counting colonies

What scientific research and application projects can the Department perform?

Bacteria are natural components of lakes, rivers, groundwater and streams. These bacteria are numerous and varied organisms. The enormous number of these small organisms can have a major impact on the processes occurring in aquatic ecosystems. They can also affect water quality by controlling the amount of oxygen and other elements in the water and causing disease in organisms as in humans.

Knowing the composition and dynamics of their population is a real indicator for determining and forecasting the state of aquatic ecosystems. Bacteria are a very important indicator for determining the level of purity of the analysed water. As the first indicators of eutrophication, they have primary importance within hydrobiological research.

The bottom sediments are an extremely important element of every aquatic ecosystem. In the sediment, heterotrophic bacteria occur most, and from here, this is where the processes of mineralization of organic matter take place most intensively.

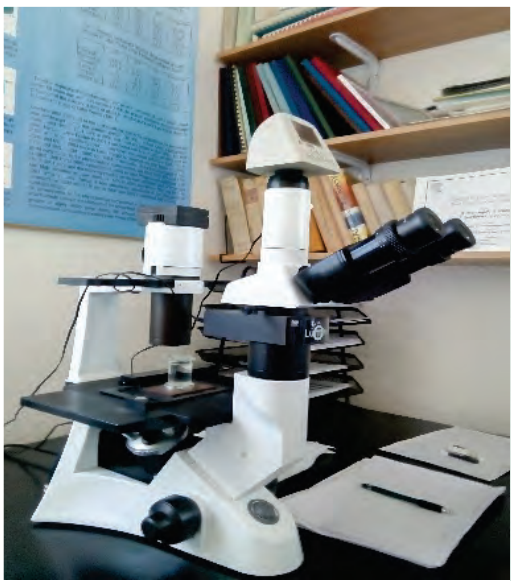
• Monitoring of the conditions in all aquatic ecosystems in Macedonia (springs, rivers, groundwater, natural lakes, reservoirs, wetlands, etc.)

• All types of microbiological analyses from sanitary and environmental aspects

• Water quality analysis for any purpose (drinking, bathing, irrigation)

• Analysis of wastewater, sediment, food.





3. DEPARTMENT OF PHYTOPLANKTON

Dr. Suzana Patcheva *- spatceva@hio.edu.mk*
Ass. Jovica Leshoski *- jleshoski@hio.edu.mk*

Short description of the Department and its purpose

The Phytoplankton department explores the planktonic and other groups of algae in the lake, river, and water from accumulations. It also determines the concentration of photosynthetic pigment chlorophyll in water, which pigment is an integral part of all groups of algae. Based on this parameter, phytoplankton biomass, primary production and trophic status of water are determined. Phytoplankton Department with Decision no. 10-7004 dated December 18, 1992, issued by the Ministry of Health of the Republic of Macedonia is authorized by the biological aspect (phytoplankton research) to monitor the correctness of the surface waters used for water supply and processed water from the filter stations in the country, in several cities in Macedonia.

Equipment in the Department:

- Inverted microscope, truinocular LW101-2 with epilmumines-cence and camera, OmniVID;
8.0MP
- AlgaeTorch 10 with accessories
- Flow cytometer CytoBuoy
- Ultrasonic bath Branson 2510 Merck- Photosynthetic Active Radiation Analyzer (PAR)

What scientific research and application projects can the Department perform?

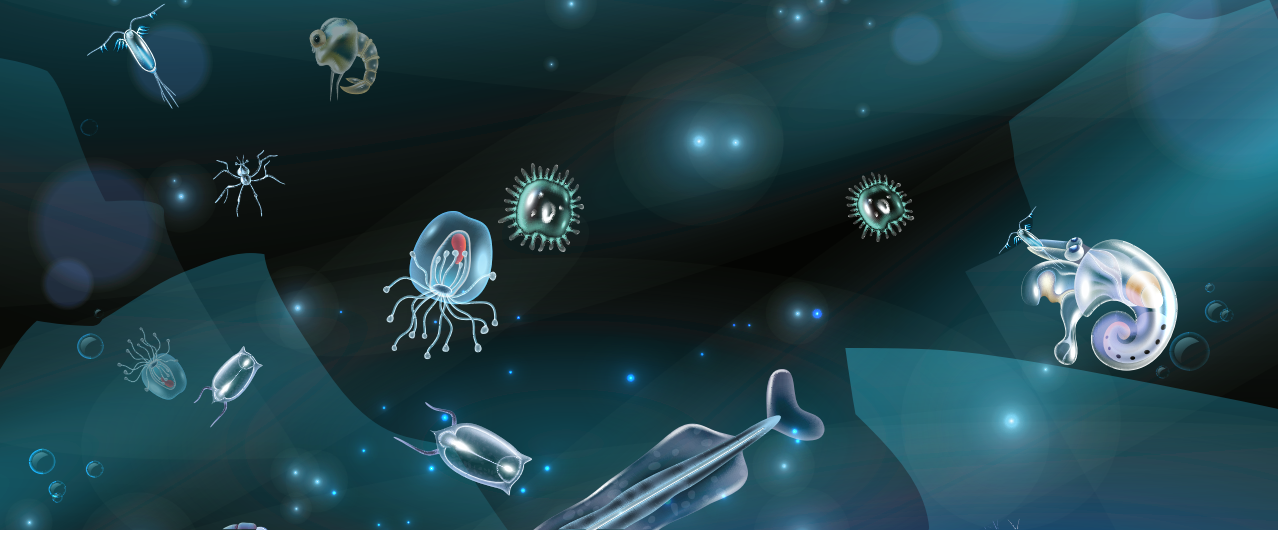
Phytoplankton forms the basis of many chains of nutrition in the lakes. It consists of many different taxa that respond to physical and chemical influences and certain types of cyanobacteria that form a that is associated with water enrichment with nutrients.

The analysis of phytoplankton uses the principle that the increase in nutrients (especially phosphorus) leads to an increase in the biomass of phytoplankton and a change in the taxonomic composition, which often leads to an increased occurrence of cyanobacteria (blue-green algae). Due to their short life cycle, planktonic algae quickly respond to environmental changes and are therefore an important indicator of water quality.

According to the Water Framework Directive (WFD), phytoplankton has been identified as a key biological quality element (BQE) to be used in assessing the ecological quality of the lake.

Chlorophyll is a green pigment in phytoplankton that allows for photosynthesis. The concentration of chlorophyll is an indicator of the phytoplankton biomass and its concentration is proportional to the total amount of phytoplankton. In addition, the concentration of chlorophyll is one of the most characteristic parameters of the trophic state of the water.

- Qualitative and quantitative composition of phytoplankton
- Determination of the concentration of chlorophyll in water from lakes and rivers
- Determination of phytoplankton biomass
- Determination of primary production
- Determination of the dependence of the phytoplankton composition and abundance in relation to the concentration of nutrients in the water and their ratio.
- Determine the trophic status index based on the concentration of chlorophyll
- Determination of phytoplankton groups and a number of organic and inorganic particles in the water with a flow cytometer.
- Determination of turbidity.



4. DEPARTMENT OF ZOOPLANKTON

Dr. Goce Kostoski *- gocekos@hio.edu.mk*
Dr. Orhideja Tasevska *- orhidejat@hio.edu.mk*

Short description of the Department and its purpose

In the Department of zooplankton, the invertebrate fauna Rotifera, Crustacea (Cladocera, Copepoda) of freshwater in the Republic of North Macedonia is studied, ie their taxonomy, ecology, reproduction, daily-night migrations, seasonal periodicity and distribution of natural and artificial reservoirs in the country. In terms of fundamental research, the Department is responsible for monitoring the conditions in all aquatic ecosystems in the North Macedonia (natural lakes, reservoirs, springs, rivers, underground waters, wetlands, etc.):

- Qualitative and quantitative research of Rotifera, Crustacea (Cladocera, Copepoda) representatives
- determination of the Saprobity index based on the representatives of Rotifera, Crustacea (Cladocera, Copepoda)
- monitoring the biomass of the representatives of the zooplankton community
- monitoring of daily-night and seasonal periodicity-migrations of zooplankton representatives

The Department of zooplankton with Decision no. 10-7004 (December 18, 1992) issued by the Ministry of Health of the Republic of North Macedonia is authorized to monitor (by biological aspect

- zooplankton research)the quality of the surface waters used for water supply and processed water from the filter stations in the country.

Equipment in the Department:

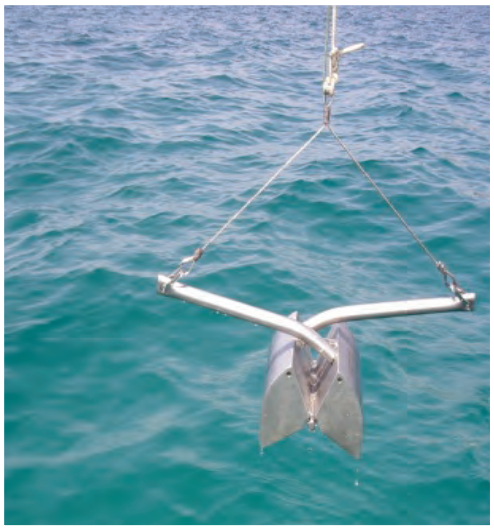
- Inverted microscope Hydro Bios
- Inverted microscope Leica DM IRB with Dino–Eye AM7023CT USB camera, and data processing software
- Compound microscope Olympus BX43 with digital camera Olympus UC30 *и* and data processing software
- Plankton nets Hydro–Bios Kiel

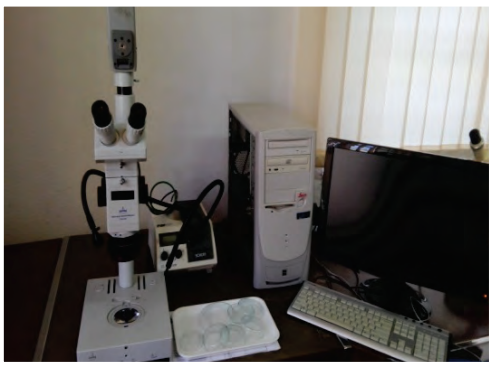
What scientific research and application projects can the Department perform?

Freshwater zooplankton has an important and strategic position in the trophic food chain in the aquatic ecosystem and is highly sensitive to anthropogenic impacts. As an integrated and inextricable part of the food chain, located between phytoplankton as its nutritional resource and fish as a predator, it reflects the changes occurring at lower and higher trophic levels. Changes in water quality, but also climate change, reflect the density and biomass of zooplankton, as well as the occurrence or absence of particular species, parameters that can be used as an effective indicator of the trophic state and the ecological status of surface waters.

- Monitoring of the quality and conditions in surface water ecosystems (natural lakes, rivers and reservoirs) on the basis of the recorded species of Rotifera, Crustacea (Cladocera, Copepoda) and changes in zooplankton communities that occur as a result of human activities
- Determining the functional and taxonomic diversity of zooplankton in all water bodies
- Enrichment of the list of species from the meiofauna, especially the groups Rotifera, Copepoda and Cladocera, ie the knowledge about biodiversity in aquatic ecosystems

- Determination of the Zooplankton Wetlands Index (WZI) as a useful indicator for degradation of water surfaces and their restoration
- Determination of the biological efficiency of the treatment plants that in North Macedonia uses surface waters for water supply
- the cultivation of certain zooplankton representatives that can be used for feeding fish offspring
- biodiversity and ecology of the invertebrate fauna Rotifera, Crustacea (Cladocera, Copepoda)





5. DEPARTMENT OF BENTHIC FAUNA

Dr. Sasho Trajanovski *- trajsa@hio.edu.mk*
Dr. Biljana Buzdakoska Gjoreska *- biljanab@hio.edu.mk*

Short description of the Department and its purpose

Qualitative and quantitative research at the bottom fauna department includes the following 8 groups of macrozoobenthos: TURBELLARIA, OLIGOCHAETA, HIRUDINEA, BIVALVIA, GASTROPODA, AMPHIPODA, ISOPODA and INSECTA. These animal species, both by diversity and by number, are most present in the fauna that inhabits the bottom of lakes and coastal waters.

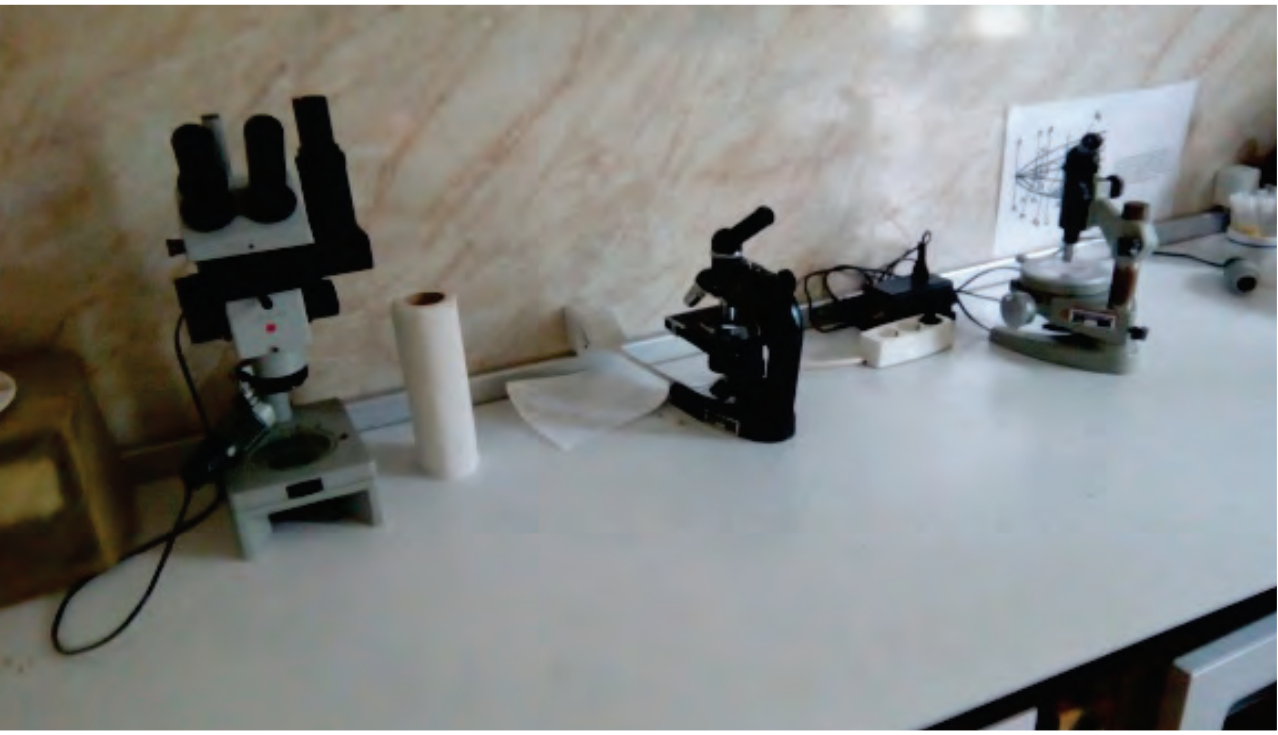
Equipment in the Department:

- Van Veen's Bottom Sampler with a surface area of 225 cm^2 (15 x 15 cm)
- Binocular Wild Heerburgg
Microscope Technik Rocthenow with Sony color video camera

What scientific research and application projects can the Department perform?

Macrozoobenthic communities are often used as indicators of the trophic state of aquatic ecosystems, as many species are vulnerable to pollution and sudden changes in their environment. Community characteristics - such as abundancy, diversity, equilibrium, and community composition - can be monitored to determine if the community changes over time due to natural or human influences.

- Environmental research by determining the ecological status of the waters by applying the WFD,
- Taxonomic research,
- Saprobiological research,
- Protection and conservation research



6. DEPARTMENT OF CYPRINID FAUNA

Dr. Trajce Talevski - *tratal2001@yahoo.com*
Ass. Blagoja Trajcevski - *blagoja.t@hio.edu.mk*

Short description of the Department and its purpose

The Department of cyprinid fauna is organized in two laboratories

1. Laboratory for fish taxonomy and ecology

This laboratory carries out taxonomic and ecological research of fish populations, determining the systematic affiliation of fish individuals as well as the ecology of fish populations.

2. Laboratory for fish physiology

This laboratory examines the physiological state of the cyprinid fish from freshwater ecosystems, and connects it with the ecotoxicological state of the ecosystems themselves.

Equipment in the Department

- stereo microscope ZEISSStemi 305
- microscope ZEISSPrimoStar
- inverted microscope ZEISSPrimoVert
- laboratory oven,
- digital scale,
- analog scale,
- digital caliper,

- centrifuge DLAB
- microplate reader METERTECH

What scientific research and application projects can the Department perform?

The department performs measurements and calculations that determine the state of the populations of fish species in lake and river ecosystems. This is done by determining the length composition of the populations, weight composition, sex composition and age composition, growth of the individuals (length and weight), tempo, constant, velocity and coefficient of length and weight growth, length-length and length-weight ratio , nutrition of fish, coefficients of food intake, dietary index of fish populations according to Fulton and according to Clark, gastro intestinal index, gonadosatomic ratio, index of maturity of gonads, absolute and relative fertility, heavy metals in the organs and tissues of cyprinid fish. Measurements of different morphometric and meristic parameters for fish species determination and comparison. Determination of the physiological status of the fish through: Condition factors, determination of the total energy content of the fish (gross energy content), determining the hematological status of the fish (total number of erythrocytes, hematocrit, hemoglobin concentration, MCH, MCHC , MCV, total number of leucocytes), and numerous biochemical parameters.



7. DEPARTMENT OF HYDROBOTANY

Dr. Marina Talevska *- mtalevska2000@yahoo.com*
Dr. Sonja Trajanovska *- sonja_stefanovska@yahoo.com*

Short description of the Department and its purpose

The Hydrobotany Laboratory was founded in 1955, and its primary activity is research on macrophytic vegetation in aquatic ecosystems in the Republic of Macedonia (lakes, rivers, reservoirs and wetland ecosystems)

Equipment in the Department:

-Van Veen grab Sampler 225 cm^2 for collecting aquatic plants
-Grab for collecting aquatic plants
-Binocular and microscope for the determination of aquatic plant species

What scientific research and application projects can the Department perform?

• Monitoring the state of macrophytic vegetation, and changes in the distribution of macrophytes
• Ecological, taxonomic, saprobiological, protection and conservation research
• Research on the content of mineral substances, especially heavy metals (N, P, K, Na, Ca, Mg, Fe, Mn, Zn, Cu, Pb, Cd) in the biomass of macrophytic aquatic plants.
• For the research of mineral substances, the equipment from the Department for physical and chemical research at the Hydrobiological Institute from Ohrid is used.


25/04/2013


25/04/2013

8. DEPARTMENT OF DISEASES OF FISH

Dr. Stojmir Stojanovski *- stojstoi@gmail.com*

Short description of the Department and its purpose

The activities of the Department of Diseases of Fish are aimed at studying the diseases of fish and other aquatic animals, and especially the parasites of fish. So far, over 100 species of parasites have been found in fish from Macedonia and wider, and some of them cause significant damage to fisheries, while others are prominent with their faunistic significance, since they have been found and described for the first time in science.

Equipment in the Department

- Stereomicroscopes ZEISS Primovet and ZEISS Primostar
- Light microscope ZEISS Stemi 305

What scientific research and application projects can the Department perform?

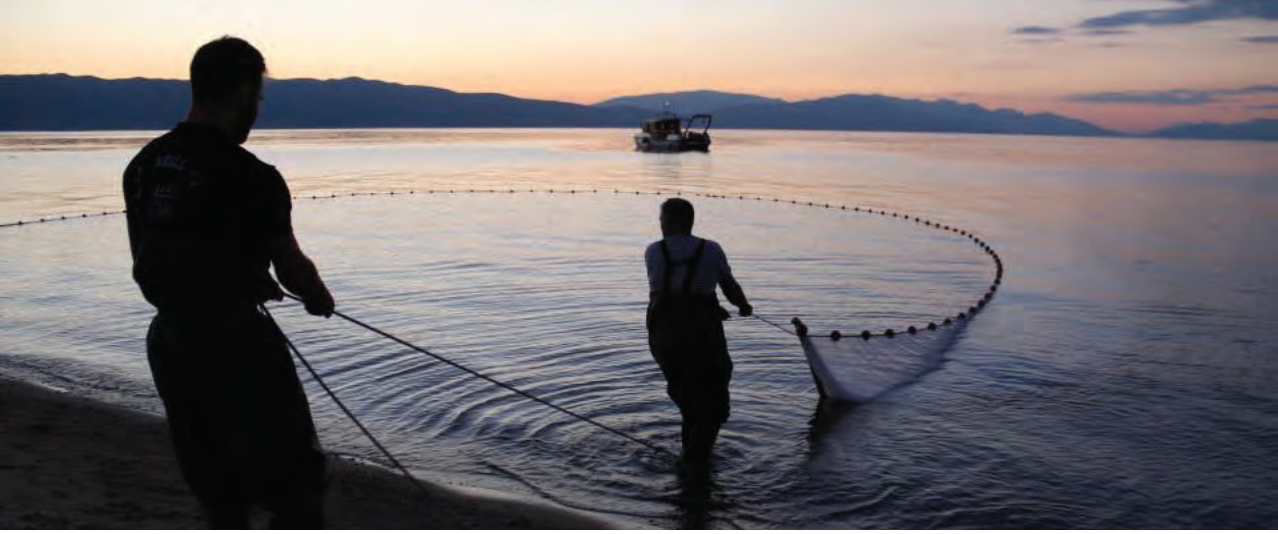
Parasites of fish appear as direct causative agents of certain diseases or as factors that lead to disturbance or reduction of fish resistance.

The analysis of the parasites offers useful, economical, simpler monitoring of the state of the environment.

The Department of Fish Diseases at the Hydrobiological Institute - Ohrid can give:

- expertise on fish and other aquatic organisms and their products from the veterinary-sanitary aspect;
- determining the dynamics of fish contamination from aquatic ecosystems by seasons and localities;

In cooperation with the other departments of the Hydrobiological Institute in Ohrid, he is involved in expert cooperation with fish farms and other subjects in solving certain problems related to the pathology of fish.



9. DEPARTMENT OF SALMONID FAUNA, APPLIED FISHERY AND AQUACULTURE (DAFA)

Ass. Zoran Spirkovski *- zoranspi@gmail.com*
Dusica Ilic Boeva *- dusicaib@hio.edu.mk*

Short description of the Department and its purpose

Since the establishment of the Institute the Department of salmonid fauna, applied fishery and aquaculture (DAFA) is dedicated to investigation of salmonid fauna (trouts) regarding their endemism, speciation, biology and fishery. Salmonid hatchery and nursery with capacity of 5 millions of eggs, alevins or fingerlings of one of the endemic Lake Ohrid trout species (*Salmo letnica*, Karaman 1924) is active since 1935 in sense of aquaculture of the endemic salmonids for restocking purposes. During the eight decades of development of tools for freshwater species conservation and restoration the number of collected fertilized eggs and released fries was varying till number of 16 million in average at annual level. In certain periods this number was even bigger – exceeding 20 million. The most important moment till 2004 is that all the caught spawners in average of 25 tons were going at the fish market. From 2005 the stocking is with 2,5 million fingerlings at age of 9 months after fertilization, all the spawners caught are returned into the lake waters – "catch and release" meth-

od, with proof of their future survival confirmed by different taggig techniques.

Regarding the developing processes of "artificial spawning" of the native population of Lake Ohrid trout (*Salmo letnica*, Karaman 1924) various techniques were implemented like: sperm cryopreservation, laser treatment of the spermatozoids and fertilized and non-fertilized eggs, crossbreeding etc. Also, cultivation of the outmost endemic salmonid Lake Ohrid belvica (*Salmo ohridana*, Steind.1892) has been developed, but from biodiversity conservation aspect this isn't implemented like standard process for lake's restocking program.

Besides the hatchery activities other responsibilities of the Department of Applied

Fishery and Aquaculture (DAFA) are fish population ecology, human impact (habitat changes and restoration in lakes and rivers; pollution impact – heavy metals, POPs; fishery impact), genetic radiation, hybridization – natural and induced for farming purposes, species conservation, fish and fisheries monitoring, fishery management plans and strategies etc.

DAFA is representing the essential unit of official registered reproduction center for wild freshwater fish species for the R. North Macedonia. From other hand Hydrobiological institute in Ohrid is the Authorized Institution for fisheries, which includes any kind of fishing in the national open waters (lakes, rivers and reservoirs) as well as fish farms control and supervision.

The aquaculture facilities are covering 1200 m^2 under fish hatchery, nursery and breeding ponds and 500 m^2 experimental aquaculture earth ponds.

Research vessel – 12 m research boat, fully equipped is used for the realization of the artificial spawning (collecting fish eggs and fertilization in situ).

Equipment in the Department:

Microscopes, binocular microscopes, echosounder, portable probes for temperature, pH, oxygen, conductivity and concentration

of cyanophyte algae. GPS devices, laser distance-meters, binoculars, field balances, static and portable oxygen tanks with regulators and aerators, as well as tanks for transferring live fish. Fish tagging equipment, electrofisher for standing and running waters, fishing nets of different type and size from knot to knot, EN 14575 fishing tools, dissection tools and biometric fish measurements equipment.

Hatchery, breeding and experimental aquaculture installations. Vessels - boat, speedboat, boats with outboard motors.

What scientific research and application projects can the Department perform?

– Lake Ohrid Annual Restocking Program of endemic trout species national and transboundary (since 1935).

– Conservation and restoration of endemic and endangered trout species (S. ohridana, S. typicus, S. aphelios, S. peristericus, S. macedonicus, etc.)

– Cryopreservation and laser induction

– PoP's and heavy metals in fish tissues

– Fishery master plans (protection and utilization) of the fish stocks in Macedonian running waters and lakes: determining TAC (total allowable catch) quotas, minimum allowable catch size per species, determining mitigation measures,

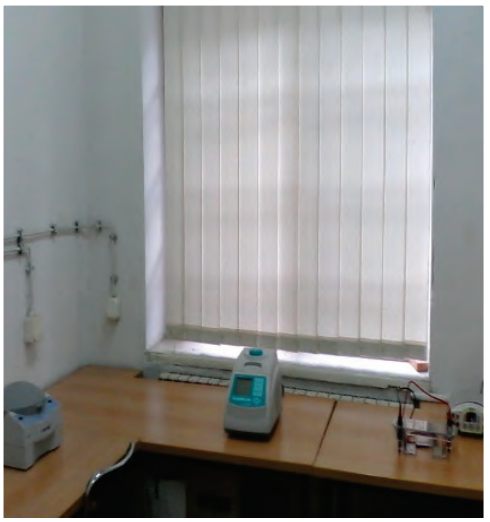
– Fish conservation and protection on transboundary level

– Ecosystem approach on fishery

– Fish and fisheries monitoring

- Aquaculture – knowledge transfer

- Education



10. DEPARTMENT OF MOLECULAR BIOLOGY

Dr. LidijaVelkova Jordanoska *- lidvejo@yahoo.com*

Short description on the Laboratory and her purpose

Department of molecular biology in PSI Hydrobiological Institute - Ohrid is consists of two Laboratories:

- Laboratory of molecular biology
- Laboratory of histology

- Laboratory of molecular biology - the use of molecular-biological methods works on population-genetic determination on several fish species which inhabit rivers and lakes in R. Macedonia.

- Laboratory of histology - there is made evaluation of environmental impact on health condition at fish populations. Through the process of histological preparations and there analysis it is an estimate on eventual lesions in internal fishes organs and on the axes on obtained date is determinate environmental impact and water quality to fishes health.

Also, in Laboratory of histology is made analysis on the Red-Ox enzyme system, like Superoxid dismutase (SOD) and Catalase (CAT) in blood and liver from fish specimens, which is marker for acute changes in water quality and environmental conditions.

Equipment in the Department:

Laboratory of molecular biology
- Ultracentrifuge,
- Thermal cycler,
- Apparatus for electrophoresis,
- UV transiluminator

Laboratory of histology
- Thermostat,
- Microtome,
- Tubes for histological dyeing,
- microscope,
- spectrophotometer

What scientific research and application projects can the Department perform?

Laboratory of molecular biology can to made population-genetically investigations on fish populations in water in R. Macedonia, in sense of determining what fishes species are inhabit rivers and lakes in our country, also hybrids determination or presence of the non-autochthonous fish species.

Laboratory of histology can to made histological and enzymatic analysis in term to provide different ecological projects. In principle, the enzymes are marker to acute change in environmental conditions and water quality, while histopathological lesions display long-lasting unfavourable impacts and presence of different xenobiotics in water, that have an adverse effect on the health on fishes populations. These markers can be an indicator of environmental condition on water ecosystems and to give instructions to their more effective protection.

TABLE OF CONTENTS: