



**THE PRELIMINARY BIOLOGICAL
WORK OF CATCHING AREAS
OF LEECHES (*Hirudo medicinalis*, Linnaeus, 1758) IN TURKEY**
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FOREWORD

This report has been prepared by **Kerevitaş Gıda San. ve Tic. A.Ş.** as a result of Mr. H. Martass's demand and the decisions taken by Mr. Frey, Mr. Brosthaus from the Sanofi Pharma S.A., Mr. martens and Mr. Kasperek from the Scientific Authority to CITES and Species Conservation, Mr. O. Merzeci, Mr. R. Mezeci and Mr. Artüz from **Kerevitaş Gıda San. ve Tic. A.Ş.** in the meeting in Istanbul on 06.11.1996.

The environmental actions of leech catch places, the regional specialties, landing techniques,

biotope and the export statistics of **Kerevitaş Gıda San. ve Tic. A.Ş.** has mainly been taken into consideration in the report.

The leech populations in big quantities are found not only in the water areas mentioned in the report but also in thousands of others with in Turkey borders, but this report mentions only the areas that leech catch is presently organized. This report has carefully and neatly been prepared to enlighten the future projects in details.

Classification of the hirudinea

About 250 species of living leeches around the world are divided into 2 orders. Mostly aquatic, or in moist places, in most parts of world. Suck blood of other animals, particularly of aquatic animals such as fishes, turtles, snails, and the like. Length to apprx. 5-10cm. and 0.75-1.5gr. greenish-black with suckers at each end. Hang on with one end while feeling about with other. Individuals bear both sex organs, the male opening between eleventh and twelfth segments;

the female on twelfth, Medical leech (*H. medicinalis*), usually found on turtles, stones and other submerged objects. May be more active at night in search of animal food, witch it locates partly by smelling.

Medicinal leeches where formerly used by people and physicians for bloodletting. Animals common in temperate zones are pests, witch may or may be not be serious enemies of living things.

Phyllum Annelida

Superclass Cliellata

Class Oligochaeta (Earthworms)

Class Hirudinea

Order Acanthobdellida

Order Rhynchobdellida

Family Piscicolidae

Family Glossiphoniidae

Order Pharyngobdellida

Family Erpobdellidae

Order Gnathobdellida

Family Haemadipsidae

Family Hirudinidae

Genus *Hirudo*

Species *medicinalis*

Biology of leeches

The leeches, class Hirudinea, have no bristles; and the external segmentation of the body does not correspond with the internal segments, of which there are fewer. The body is solid, the coelomic spaces being crowded out by the growth of connective tissue. There are a definite number of segments, for leeches do not add them on through-out life, as do other annelida. At each end of the body is a sucker, the posterior being much larger than the anterior, which has the mouth in its center.

Despite all the modifications the leeches are closely related to the oligocheta and are probably derived from them. There is no character of leeches which is not present in at least some degree in some oligocheta. Most leeches lead a semi parasitic life, sucking the blood of vertebrata, although some of them have lost this habit and feed on small animals. They show some of the adaptations for parasitism that were noted among flatworms, namely, the development of clinging organs, the suckers, and the extreme complication of the reproductive system.

On the other hand, since they need to swim about to locate victims, they are less modified than flukes or tapeworms and have eyes. In sucking blood, a leech attaches to some

vertebrate by the posterior sucker, applies the anterior sucker to skin, makes wound, often with the aid of little jaws inside the mouth, fills its digestive tract with blood, and then drops off, remaining torpid while digesting the meal. Large blood meals are few and far between, but the digestive tract has lateral pouches which hold enough blood to last for months.

The salivary glands of leeches manufacture a substance called Hirudin, which prevents the coagulation of the blood while the leech is taking its meal. For this reason a wound made by a leech continues to bleed for a long time after the leech has detached itself.

Most of the annelida or true worms belong to the burrowing group, but all the members of one order, the Hirudinea or leeches, dwell among weeds or stones. A sucker at the head end and another at the tail end of the body are characteristic of the leeches. By using these suckers they can progress from place to place rapidly, "looping" like a geometrid caterpillar, but most can also swim quite effectively with an undulating motion. They are nearly all bloodsuckers, and a single meal is usually very large, and therefore not digested for a long time. Perhaps for this reason leeches are usually to be found motionless attached to some solid object.

	Gala lake	Terkos lake	Samsun lake complex	Pond and canals in Bolu aerea
Sodium	5.8	1.8	3.8	5.1
Potassium		7.5		5.7
Magnesium	0.72	26.5	15	3.9
Calcium	0.8	1.1	1.7 18	1.5 -79-
Chloride	5.7	18		
Sulphate	4.6	9	14	33
Carbonate	1.2	68	82	57
Silicon dioxide	1.6	none	2	9

The metallic and acidic radicals of the commoner dissolved substances in certain natural waters. Figures in parts per million.

-The lake of Terkos (Durusu Lake)

The Lake of Terkos is in 50 km north-west of Istanbul right behind Karaburun coast. The area of the Lake which has some many different figures, is 25 km², maximum depth is 11m. The surface of the Lake is 2.75m higher than sea level, it has no water flow to the sea. It used to let outlet of Lake called Boğazdere, flow to Black Sea, before. That is the reason, salty water of the Lake changed to fresh water during the time. After a line of jetsam was built in the spot where the outlet of the Lake was, the water was stopped out letting from the Lake continuously. And the water level of the Lake got higher a bit. Because of none flowing in water course, the mouth of outlet has been closed by sand which waves prepared. The Lake of Terkos is by 100-150m. high hill area where there are Eosen calcareous and Marns, covered with Neogen

sand and pebbel sources in same parts. There is a low line of jetsam and sandy coast between Sea and Lake in north. In fact the place of Terkos Lake used to be bay. Terkos Lake seems to be happened with bay's mouths of streams which are involved by sea. The drainage basin of Terkos Lake is very small, the streams which carry water to the Lake are much. The largest and the most water carrier of these is Istranca River which flows from west. There streams caused the water got fresh so fast after big line of jetsam (sand coast) split the lake from the sea. As known, there is a plant called TERKOS FRESH WATER PLANT for collecting and distributing the water of the Lake to Istanbul in Terkos village, which the name of Lake had been taken from since 1958.

Summary of the classification of main groups of aquatic animals in the lake of Durusu:

Sub-kingdom: PROTOZOA.

Class FLAGELLATA (*Mastigaphora*) *Euglena*, *Ceratium* sp., *Dinobrion* sp.,
Euglena sp.

Class SARCODINA (*Rhizopoda*) *Amoeba*, *Actinophrys* sp.

Class CILIOPHORA *Paramecium*, *Vorticella*.

Sub-kingdom: PARAZOA

Phylum : PORIFERA *Spongilla lacustris*, *Ephydatia* sp.,

Sub-kingdom : METAZOA

Phylum : COELENTERATA

Class HYDROZOA *Cordylophora lacustris*, *Chlorohydra viridissima*, *Hydra vulgaris*,
Hydra oligactis.

Phylum: PLATYHELMINTHES

Class TURBELLARI'A

Order Rhabdocoelida *Dalyellia viridis*.

Order Tricladida *Planaria gonocephala*, *Planaria vitta*, *Dendrocoelum* sp.,
Polycelis cornuta.

Phylum ROTIFERA *Limnias ceratophylli*, *Synchaeta pectinata*, *Keratella quadrata*,
Trichocerca cristate, *Brachionus calyciflorus*.

Phylum ANNELIDA

Class CHAETOPODA

Order OIGOCHAETA *Lumbriculus* sp., *Stylaria* sp..

Class HIRUDINEA *Hirudo medicinalis*, *Piscicola geometra*, *Hemiclepsis marginata*.

Phylum POLYZOA (*Pulmatella*) *Lophobus* sp..

Phylum ARTHROPODA

Sub-phylum CRUSTACEA

Class BRANCHIOPODA

Order ANOSTRACA *Chirocephalus diaphanus*.

Order NOSTRACA *Triops cancriformis*.

Order DIPLOSTRACA

Sub-order CLADOCERA *Daphnia hyalina*, *Chydorus ovalis*, *Bosmina obtusirostris*.

Class OSTRACODA *Cypris* sp..

Class COPEPODA *Cyclops viridis*.
Class BRANCHIURA *Argulus foliaceus*.
Class MALACOSTRACA
Order ISOPODA *Asellus aquaticus*, *Asellus meridianus*.
Order AMPHIPODA *Gammarus sp.*.
Order DECAPODA *Astacus leptodactylus*
Sub-phylum INSECTA
Class PTERYGOTA
Sub-class EXOPTERYGOTA
Order PLECOPTERA *Perla carlukiana*, *Chloroperla torrentium*, *Capnia nigra*
Order ODONATA *Anax imperator*, *Libellula quadrimaculata*, *Libellula depressa*,
Sympetrum striolatum, *Cordulagaster boltonii*.
Order HEMIPTERA *Velia currens*, *Hydrometra stagnorum*.
Order EPHEMEROPTERA *Ephemera vulgata*, *Centropillum luteolum*.
Sub-class ENDOPTERYGOTA
Order NEUROPTERA *Osmylus sp.*
Order TRICHOPTERA *Philopotamus viridis*, *Glyptotendipes pellucidus*,
Phryganea sp.
Order LEPIDOPTERA *Nymphula nymphaeta*, *Cataclysta lemnata*.
Order COLEOPTERA *Ilybius ater*, *Hydrous piceus*, *Laccophilus variegatus*,
Dytiscus marginalis, *Gyrinus natator*, *Rantus notatus*, *Hydrobius fuscipes*.
Order DIPTERA *Anopheles sp.*, *Tanyipus sp.*.
Order HYMENOPTERA *Agriotypus sp.*
Sub-phylum ARACHNIDA
Class ACARINA *Diplodontus despiciens*, *Hydrarachna globose*.
Phylum MOLLUSCA
Class GASTROPODA *Limnea stagnalis*, *Valvata piscinalis*, *Viviparus viviparus*,
Planorbis planorbis, *Planorbis vortex*.
Class LAMELLIBRANCIATA *Margaritifera margaritifera*, *Unio sp.*, *Anodonta cygnea*.
Phylum CHORDATA (VERTEBRATA)
Class PISCES *Anguilla anguilla*, *Silurus glanis*, *Perca fluviatilis*, *Tinea tinea*,
Cyprinus carpio, *Esox lucius*, *Rutilus rutilus*, *R. frisii*, *Leucaspis delineatus*, *Leuciscus leuciscus*,
L. borysthenticus, *L. rutilus*, *L. cephalus*, *Phoxinus phoxinus*, *Scardinius erythrophthalmus*, *Aspius aspius*,
Chondrostoma nasus, *Gobio gobio*, *Chalcalburnus chalcoides*, *Alburnus alburnus*, *Alburnoides*
bipunctatus, *Blicca bjoerkna*, *Abramis brama*, *Vimba vimba*, *Rhodeus amarus*, *Carassius carassius*,
Noemacheilus barbatulus, *Noemacheilus angorae*, *Cobitis taenia*, *Gambusia affinis*,
Gastosteus aculeatus, *Salapia fluviatilis*, *Neogobius fluviatilis*, *N. cephalargus*, *N. gymnotrachelus*,
N. kessleri, *N. melanostomus*, *Proterorhinus marmoratus*, *Zosterisessor ophiocephalus*.
Class AMPHIBIA *Rana ridibunda*, *Rana esculenta*, *Bufo calamita*.
Class AVES *Anser albifrons*, *A. anser*, *A. fabalis*, *A. erythrophus*, *Branta ruficollis*,
Tadorna tadorna, *T. ferruginea*, *Anas platyrhynchos*, *A. strepera*, *A. penelope*, *A. crecca*, *A.*
querquedula, *A. acuta*, *A. clypeata*, *A. angustirostris*, *Netta rufina*, *Aythya*
fuligula, *A. mania*, *A. ferina*, *A. nyroca*, *Melanitta fusca*, *M. nigra*, *Bucephala clangula*,
Mergus albellus, *Cygnus olor*, *C. cygnus*, *C. bewickii*, *Oxyura leucocephala*, *Mergus*
mergamser, *M. serrator*, *Gravia arctica*, *G. ilmmmer*, *Podiceps cristatus*, *P. grisaigena*,
P. auritus, *P. nigricollis*, *P. ruficollis*, *Hydrobates pelagicus*, *Pelecanus onocrotalus*,
Phalacrocorax aristotelis, *P. carbo*, *P. pygmeus*, *Ardea cinerea*, *A. purpurea*, *Egretta alba*,
E. garzetta, *Bubulcus ibis*, *Ardeola ralloides*, *Nycticorax nycticorax*, *Ixobrychus minitus*,
Botaurus stellaris, *Ciconia ciconia*, *C. nigra*, *Grus grus*, *Anthropoides virgo*,
Rallus aquaticus, *Galinula chloropus*, *Porzana porzana*, *P. pusilla*, *P. pan/a*,
Porphyrio porphyrio, *Fulica atra*, *Hoplopterus indicus*.
Class MAMMALIA *Canis lupus*, *C. aureus*, *Vulpes vulpes*, *Sus scrofa*, *Herpestes ichneumon*,
Gazella dorcas, *Felis chaus*, *Lutra lutra*

-The Samsun lakes and environmental compartments

The ponds which contain leeches around Samsun region are situated in the area between Yeşilirmak and Kızılırmak. The mentioned area contains thousands of natural and artificial ponds of various sizes.

The area which is mostly marshy place and is fed by either Kızılırmak and Yeşilirmak or by the heavy rain falls. The largest lagoon of Yeşilirmak delta is Semelik pond with the area of 19 km² in the eastern delta. The lagoon which is separated whit thin line of jetsam from the Black sea and is mostly a marshy place for the most of the year. In this part of the lagoon between Çaltı Feneri and Sancaklı, there are five more lagoons separated by the thin lines of

jetsam from the sea. In the west shore of the delta there are eight small lagoons situated side by side and all of them have the fresh water features. The lagoons and ponds of the Kızılırmak delta are larger. Balık Lake in the east of delta has the area of 37 km². The width of the line of jetsam which separates the lake from the sea changes between 0.5 or 2km. The other two lagoons in the east half of the delta are Liman Lake and Tuzlu Lake. Karaboğaz lake which is in the west part of Kızılırmak delta passes thought the delta by running down the southern hills but it is nothing more than a watercourse because its mouth is blocked with the shore with line of jetsam.

Summary of the classification of main groups of aquatic animals in the Samsun takes and environmental compartments:

Sub-kingdom: PROTOZOA.

Class FLAGELLATA (*Mastigaphora*) *Euglena*, *Ceratium* sp., *Dinobrion* sp.,
Euglena sp.

Class SARCODINA (*Rhizopoda*) *Amoeba*, *Actinophrys* sp.

Class CILIOPHORA *Paramecium*, *Vorticella*.

Sub-kingdom: PARAZOA

Phylum : PORIFERA *Spongilla lacustris*, *Ephydatia* sp..

Sub-kingdom : METAZOA

Phylum : COELENTERATA

Class HYDROZOA *Cordylophora laucustris*, *Chlorohydra viridissima*, *Hydra vulgaris*,
Hydra oligactis.

Phylum : PLATYHELMINTHES

Class TURBELLARIA

Order Rhabdoceolida *Dalyellia vihdis*.

Order Tricladida *Planaha gonocephala*, *Planaria vitta*, *Dendrocoelum* sp.,
Polycelis cornuta.

Phylum ROTIFERA *Limnias ceratophylli*, *Synchaeta pectinata*, *Keratella quadrata*,
Trichocerca cristata, *Brachionus calyciflorus*.

Phylum ANNELIDA

Class CHAETOPODA

Order OIGOCHAETA *Lumbriculus* sp., *Stylaria* sp..

Class HIRUDINEA *Hirudo medicinalis*, *Piscicola geometra*, *Hemiclepsis marginata*.

Phylum POLYZOA (*Pulmatella*) *Lophobus* sp..

Phylum ARTHROPODA

Sub-phylum CRUSTACEA

Class BRANCHIOPODA

Order ANOSTRACA *Chirocephalus diaphanus*.

Order NOSTRACA *Thops cancriformis*.

Order DIPLOSTRACA

Sub-order CLADOCERA *Daphnia hyaiina*, *Chydorus ovalis*, *Bosmina obtusirostris*.

Class OSTRACODA *Cypris* sp..

Class COPEPODA *Cyclops viridis*.

Class BRANCHIURA *Argulus foliaceus*.

Class MALACOSTRACA

Order ISOPODA *Asellus aquaticus*, *Asellus meridianus*.

Order AMPHIPODA *Gammarus sp.*

Order DECAPODA *Astacus leptodactylus*

Sub-phylum INSECTA

Class PTERYGOTA

Sub-class EXOPTERYGOTA

Order PLECOPTERA *Per/a carlukiana, Chloroperia torrentium, Capnia nigra*

Order ODONATA *Anax imperator, Libellula quadhmaculata, Libellula depressa, Sympetrum striolatum, Cordulagaster boltonii.*

Order HEMiPTERA *Velia currens, Hydrometra stagnorum.*

Order EPHEMEROPTERA *Ephemera vulgata, Centropillufn luteolum.*

Sub-class ENDOPTERYGOTA

Order NEUROPTERA *Osmylus sp.*

Order TRICHOPTERA *Philopotamus viridis, Glyphotaelius petlucidus, Phryganea sp.*

Order LEPIDOPTERA *Nymphula nymphaeata, Cataclysta lemnata.*

Order COLEOPTERA *llybus ater, Hydrous piceus, Laccopilus varigatus, Dytiscus marginalis, Gyrimus natator, Rantus notatus, Hydrobius fuscipes.*

Order DIPTERA *Anopheles sp., Tanyipus sp..*

Order HYMEN OPTERA *Agriotypus sp..*

Sub-phylum ARACHNIDA

Class ACARINA *Diplodontus despiciens, Hydrarachna globosa.*

Phylum MOLLUSCA

Class GASTROPODA *Limnea stagnalis, Valvata piscinalis, Viviparus viviparus, Planorbis planorbis, Planorbis vortex.*

Class LAMELLIBRANCIATA *Margaritififer margaritififer, Unio sp., Anodonta cygnea.*

Phylum CHORDATA (VERTEBRATA)

Class PISCES *Anguilla anguilla, Cyprinus carpio, Esox lucius, , Leuciscus borysthenicus, L. cephalus, Scardinius erythrophthalmus, Aspius aspius, Gobio gobio, , Alburnoides bipunctatus, Vimba vimba, Rhodeus amarus, Noemacheilus angorae, Silurus glanis, Gastrosteus aculeatus, Gobioides niger, Neogobius fluviatilis, N. cephalarges, N. melanostomus, Pomatoschistus microps, Zostehsessor ophiocephalus, Proterorhinus marmoratus.*

Class AMPHIBIA *Rana ridibunda, Rana esculenta, Bufo calamita.*

Class AVES *Anser albifrons, A. anser, A. fabalis, A. erythrophus, Branta ruficollis, Tadorna tadorna, T. ferruginae, Anas platyrhynchos, A. strepera, A. penelope, A. crecca, A. querquedula, A. acuta, A. clypeata, A. angustirostris, Netta rufina, Aythya fuligula, A. mania, A. ferina, A. nyorca, Melanitta fusca, M. nigra, Bucephala clangula, Mergus albellus, Cygnus olor, C. cygnus, C. bewickii, Oxyura laucocephala, Mergus merganser, M. serrator, Gravia arctica, G.ilmmer, Podiceps cristatus, P. grisaigena, P.auritus, P. nighcollis, P. ruficollis, Hydrobates pelagicus, Pelecanus onocrotalus, P. chppus, Phalacrocorax aristotelis, P. carbo, P. pygmeus, Ardea cinerea, A. purpurea, Egretta alba, E. garzetta, Bubulcus ibis, Ardeola ralloides, Nycticorax nycticorax, Ixobrychus minitus, Botaurus stellaris, Ciconia ciconia, C. nigra, Grus grus, Anthropoides virgo, Rallus aquaticus, Galinula chloropus, Porzana porzana, P. pusilla, P. parva, Porphyrio porphyrio, Fulica atra, Platalea leucorodia, Himantopus himantopus, Charadrius hiaticula, Hoplopterus spinosus, Pluvialis apricaria, P. aquatarola, Charadrius asiaticus, C. mongolus, Eudromias morinellus, Larus genei, L. minutus, L.audouinii, L. ichyaetus, Rissa tridactyla.*

Class MAMAL/A *Canis lupus, C. aureus, Vulpes vulpes, Sus scrofa, Herpestes ichneumon, Gazella dorcas, Felis cheaus, Lutra lutra*

- The fresh water complex of Gala Lake

The fresh water complex is a typical valley-side lake complex. Most parts of the wide valley occurred by the Meriç River are rushy and marshy places. Among those marshy places some parts are shallow ponds and lakes. The largest of them all is the Gala Lake with the area of 9.5 km² and it gives the impression as if it is an old part of a watercourse which belongs to Meriç River. All water units are separated from each other by blockades and especially the direction of İpsala and Enez are fertilized for the agriculture of rice. The water complex is intensively covered by rushy places and intensive vegetation is seen there. Leeches catch

is done, from time to time. In the pond-like waters and channels that are all related with the main system. Light penetrates into the Gala Lake and to the environmental ponds and canals sufficiently far to permit plant growth down to a depth of about 5 meters or so. Planktonic algae are present in the water all through the year with small fluctuations. Some time in the early months of the year, for reasons which are at present unknown and which pose one of the main problems of the day, these algae begin to multiply and the surfaces is totally green. (like a bluming.). Accordingly this overgrow constitutes a best habitat for the leeches.

Summary of the classification of main groups of aquatic animals in the fresh water complex of Gala Lake:

Sub-kingdom: PROTOZOA.

Class **FLAGELLATA** (*Mastigaphora*) *Euglena*, *Ceratium* sp., *Dinobrion* sp.,
Euglena sp.

Class **SARCODINA** (*Rhizopoda*) *Amoeba*, *Actinophrys* sp.

Class **CILIOPHORA** *Paramecium*, *Vorticella*.

Sub-kingdom: PARAZOA

Phylum : **PORiFERA** *Spongilla lacustris*, *Ephydatia* sp..

Sub-kingdom : METAZOA

Phylum : **COELENTERATA**

Class **HYDROZOA** *Cordylophora laucustris*, *Chlorohydra viridissima*, *Hydra vulgaris*,
Hydra oligactis.

Phylum: **PLATYHELMI'NTHES**

Class **TURBELLARIA**

Order **Rhabdocoelida** *Dalyellia viridis*.

Order **Tricladida** *Planaria goonocephala*, *Planaha vitta*, *Dendrocoelum* sp.,
Polycelis cornuta.

Phylum **ROTIFERA** *Limnias ceratophylli*, *Synchaeta pectinata*, *Keratella quadrata*,
Trichocerca cristate, *Brachionus calcyciflorus*.

Phylum **ANNELIDA**

Class **CHAETOPODA**

Order **OIGOCHAETA** *Lumbriculus* sp., *Stylaria* sp..

Class **HIRUDINEA** *Hirudo medicinalis*, *Piscicola geometra*, *Hemiclepsis marginata*.

Phylum **POLYZOA** (*Pulmatella*) *Lophobus* sp..

Phylum **ARTHROPODA**

Sub-phylum **CRUSTACEA**

Class **BRANCHIOPODA**

Order **ANOSTRACA** *Chirocephalus diaphanus*.

Order **NOSTRACA** *Triops cancriformis*.

Order **DIPLOSTRACA**

Sub-order **CLADOCERA** *Daphnia hyalina*, *Chydorus ovalis*, *Bosmina obtusirostris*.

Class **OSTRACODA** *Cypris* sp..

Class **COPEPODA** *Cyclops viridis*.

Class **BRANCHIURA** *Argulus foliaceus*.

Class **MALACOSTRACA**

Order ISOPODA *Asellus aquaticus*, *Asellus meridianus*.

Order AMPHIPODA *Gammarus* sp..

Order DECAPODA *Astacus leptodactylus*

Sub-phylum INSECTA

Class PTERYGOTA

Sub-class EXOPTERYGOTA

Order PLECOPTERA *Perla carlukiana*, *Chloroperia torrentium*, *Capnia nigra*

Order ODONATA *Anax imperator*, *Libellula quadrimaculata*, *Libellula depressa*,
Sympetrum striolatum, *Cordulagaster boltonii*.

Order HEMIPTERA *Velia currens*, *Hydrometra stagnorum*.

Order EPHEMEROPTERA *Ephemera vulgata*, *Centropillum luteolum*.

Sub-class ENDOPTERYGOTA

Order NEUROPTERA *Osmylus* sp.

Order TRICHOPTERA *Philopotamus viridis*, *Glyphotaelius pellucidus*,
Phryganea sp.

Order LEPIDOPTERA *Nymphula nymphæta*, *Cataclysta lemnata*.

Order COLEOPTERA *Ilybius ater*, *Hydrous piceus*, *Laccophilus variegatus*,
Dytiscus marginalis, *Gyrinus natator*, *Rantus notatus*, *Hydrobius fuscipes*.

Order DIPTERA *Anopheles* sp., *Tanyipus* sp..

Order HYMENOPTERA *Agriotypus* sp..

Sub-phylum ARACHNIDA

Class ACARINA *Diplodontus despiciens*, *Hydra rachna globosa*.

Phylum MOLLUSCA

Class GASTROPODA *Limnea stagnalis*, *Valvata piscinalis*, *Viviparus viviparus*,
Planorbis planorbis, *Planorbis vortex*.

Class LAMELLIBRANCIATA *Margaritifera margaritifera*, *Unio* sp.,
Anodonta cygnea.

Phylum CHORDATA (VERTEBRATA)

Class PISCES *Leuciscus rutilus*, *Anguilla anguilla*, *Gastrosteus aculatus*, *Perca fluviatilis*,
Tinca tinca, *Cyprinus carpio*, *Esox lucius*, *Rutilus rutilus*, *Rutilus frisii*,
Leuciscus leuciscus, *Leuciscus borysthenticus*, *Phoxinus phoxinus*, *Scardinius erythrophthalmus*,
Aspius aspius, *Chondrostoma nasus*, *Gobio gobio*, *Chalcalburnus chalcoides*,
Alburnus alburnus, *Alburnoides bipunctatus*, *Blicca bjoerkna*, *Abramis brama*,
Vimba vimba, *Rhodeus amarus*, *Carassius carassius*, *Noemacheilus barbatulus*,
N. angorae, *Cobitis teen/a*, *Silurus glanis*, *Gambusia affinis*, *Neogobius fluviatilis*,
Neogobius cephalarges..

Class AMPHIBIA *Rana ridibunda*, *Rana esculenta*, *Bufo calamita*.

Class AVES *Anser albifrons*, *A. anser*, *A. fabalis*, *A. erythrophus*,
Branta ruficollis, *Tadorna tadorna*, *T. ferruginae*, *Anas platyrhynchos*, *A. store para*,
A. penelope, *A. crecca*, *A. querquedula*, *A. acuta*, *A. clypeata*, *A. angustirostris*,
Netta rufina, *Aythya fuligula*, *A. mania*, *A. ferina*, *A. nyorca*, *Melanitta fusca*, *M. nigra*,
Bucephala clangula, *Mergus albellus*, *Cygnus olor*, *C. cygnus*, *C. bewickii*,
Oxyura laucocephala, *Mergus merganser*, *M. serrator*, *Gravia arctica*, *G. immer*,
Podiceps cristatus, *P. grisaigena*, *P. auritus*, *P. nigricollis*, *P. ruficollis*, *Hydrobates pelagicus*,
Pelecanus onocrotalus, *P. crippus*, *Phalacrocorax aristotelis*, *P. carbo*, *P. pygmeus*,
Ardea cinerea, *A. purpurea*, *Egretta alba*, *E. garzetta*, *Bubulcus ibis*, *Ardeola ralloides*,
Nycticorax nycticorax, *Ixobrychus minutus*, *Botaurus stellaris*, *Ciconia ciconia*, *C. nigra*,
Grus grus, *Anthropoides virgo*, *Rallus aquaticus*, *Galinula chloropus*, *Porzana porzana*,
P. pusilla, *P. parva*, *Porphyrio porphyrio*, *Fulica atra*

Class MAMMALIA *Canis lupus*, *C. aureus*, *Vulpes vulpes*, *Sus scrofa*,
Herpestes ichneumon, *Gazella dorcas*, *Felis cheaus*, *Lutra lutra*

- Ponds and canals in Bolu region

Around the platos and mountains of north-west Anatolia are tectonic originated depressions **are** found. These are known to be situated on the epirogenic zone of the Paflagonia.

One of these tectonic hollows is the Düzce Valley and around it there are a lot of marshy places which are surrounded by ponds. Because of the rain falls and the height in this area there are numbers of tectonic fault originated canals and marsh originated ponds.

Again in this area there is Melen Lake with the area of 5km² and 100m. height which

surrounded alivion valley, and there are a lot of small rivers (streams) directed to the lake.

According to the geological datas the closed river basin that is formed as a result of karsting.

In the ponds and canals in Bolu region, four main zones of life may be recognized: Each of these zones has pelicular advantages and disadvantages, and consequently its own characteristic communities are capable of living conditions.

1. The surface-film.

2. The region of submerged and floating vegetation.

3. The open water.

4. The bottom mud.

The surface-film:

This frontier between air and water provides a habitat with adequate oxygen, abundant food in the form of small creatures that have fallen accidentally there, and comparative freedom from predators.

The zone has been colonized by a number of insects that are beautifully adapted to live there - light, slender water bugs (*Velia currens*, *Ranatra linearis*, *Corixa sp*, *Notonecta sp...*), such as the pond skater and water measurer

(*Hydrometra stagnorum*, *Gems sp...*) whose slight weight spread over a wide area by means of long legs, the tips of which sometimes bear water-repellent hairs, enables them to be supported en the surface -film. Actively swimming there are the whirling beets, while below, hanging from the underside of the film are the larvae and pupae of two-winged flies (*Ceratopogon sp.*, *Tanypus sp.*, *Anopheles sp...*), such as gnats.

The region of submerged and floating vegetation:

From the pond margins to a distance that varies in every stretch of water is a zone of vegetation - a region of abundant food and also plentiful oxygen, derived from the photosynthesis of the plants, but with a good deal of competition among the inhabitants.

Here live the greatest variety of species; beetles, both larval and adult. (*Hydrous piceus*, *Dysticus marginalis*, *Gyrinus natator*, *Agabus sp.*, *Hydroporus erythrocephalus.....*), water bugs, (*Velia currens*, *Ranatra linearis*, *Corixa sp.*, *Notonecta sp ...*) dragonfly (*Anax imperator*, *Libellula quadrimaculata*, *Sympetrum sp.*, *Libellula depressa*, *Cordulagaster sp...*) and mayfly (*Centroptilum luteolum*, *Cleoeon sp.*, *Beatis sp.*, *Ephemera sp...*) nymphs, snails (*Planorbis planorbis*, *P. vortex*, *P. Carinatus*,

Physa frontinalis ...). mites (*Diplodontus sp.*, *Hydrarachna globosa*. *Dytiscus marginalis ...*) flatworms (*Planaria sp. ...*) and leeches (*Hirudo medicinalis*, *Theromyzon tessellata*, *Helobdella stagnalis....*).

The open water: Free-swimming or free-floating organisms from the main population of the area of open water towards the middle of the pond. These include the largest members of the fauna - the fish, and the smallest - the planktonic animals which from a large part of their food, including water-fleas (*Chydorus ovalis*, *Bosmina obtusirostris*, *Daphnia hyaline....*) and rotifers (*Synchaeta pectinata*, *Keratella quadrata*, *Trichocerca cristata*, *Brachionus calyciflorus....*).

The bottom mud:

This apparently unpromising zone supports nevertheless a surprisingly large number of individuals, if of few species. Food may be plentiful in the form of decaying plant and animal remains, but oxygen may be scarce.

Creatures that can thrive in these conditions include the "bloodworm" larvae of midges and annelid worms (specially *H. medicinalis*) such

as leeches, all possessing the red blood pigment haemoglobin which, on account of its great affinity for oxygen enables them to make the most of what little of this gas is present.

Here, too, may be found bivalve molluscs, (*Sphaerium corneum*, *Anodonta cygnea*, *Dreissena sp. ...*)

Summary of the classification of main groups of aquatic animals in the pond and canals in Bolu region :

Sub-kingdom: PROTOZOA.

Class FLAGELLATA (*Mastigaphora*) *Euglena*, *Ceratium sp.*, *Dinobrion sp.*, *Euglena sp.*

Class SARCODINA (*Rhizopoda*) *Amoeba*, *Actinophrys sp.*

Class CILIOPHORA *Paramecium*, *Vorticella*.

Sub-kingdom: PARAZOA

Phylum : PORIFERA *Spongilla lacustris*, *Ephydatia sp.*

Sub-kingdom: METAZOA

Phylum: COELENTERATA

Class HYDROZOA *Cordylophora lacustris*, *Chlorohydra viridissima*, *Hydra vulgaris*, *Hydra oligactis*.

Phylum: PLATYHELMINTHES

Class TURBELLARIA

Order Rhabdocoelida *Dalyellia viridis*.

Order Tricladida *Planaria goonocephala*, *Planaria vitta*, *Dendrocoelum sp.*, *Polycelis cornuta*.

Phylum ROTIFERA, *Synchaeta pectinate*, *Keratella quadrata*, *Trichocerca cristata*, *Brachionus calyciflorus*.

Phylum ANNELIDA

Class CHAETOPODA

Order OIGOCHAETA *Lumbriculus sp.*, *Stylaria sp.*

Class HIRUDINEA *Hirudo medicinalis*, *Helobdella stagnalis*, *Theromyzon tesellata*.

Phylum POLYZOA (*Pulmatella*) *Lophobus sp.*

Phylum ARTHROPODA

Sub-phylum CRUSTACEA

Class BRANCHIOPODA

Order ANOSTRACA *Chirocephalus diaphanus*.

Order NOSTRACA *Triops cancriformis*.

Order DIPLOSTRACA

Sub-order CLADOCERA *Daphnia hyalina*, *Chydorus ovalis*, *Bosmina obtusirostris*.

Class OSTRACODA *Cyprissp.*

Class COPEPODA *Cyclops viridis*.

Class BRANCHIURA *Argulus foliaceus*.

Class MALACOSTRACA

Order ISOPODA *Asellus aquaticus*, *Asellus meridianus*.

Order AMPHIPODA *Gammarus sp.*

Order DECAPODA *Astacus leptodactylus*

Sub-phylum INSECTA

Class PTERYGOTA

Sub-class EXOPTERYGOTA

Order PLECOPTERA *Perla carlukiana*, *Chloroperia torrentium*, *Capnia nigra*

Order ODONATA *Anax imperator, Libellula quadrimaculata, Libellula depressa, Sympetrum striolatum, Cordulagaster boltonii.*

Order HEMIPTERA *Velia currens, Ranatra linearis, Corixa sp, Notonecta sp.*

Order EPHEMEROPTERA *Ephemera vulgata, Centropillum luteolum, Cleoeon sp, Beatis sp.*

Sub-class ENDOPTERYGOTA

Order NEUROPTERA *Osmylus sp.*

Order TRICHOPTERA *Philopotamus viridis, Glyphotaelius pellucidus, Phryganea sp.*

Order LEPIDOPTERA *Nymphula nymphaeta, Cataclysta lemnata.*

Order COLEOPTERA *Hydrous piceus,, Dytiscus marginalis, Gyrimus natator, Agabus sp., Hydrophorus erythrocephalus.*

Order DIPTERA *Anopheles sp., Tanyipus sp., Ceratopogon sp..*

Order HYMENOPTERA *Agriotypus sp..*

Sub-phylum ARACHNIDA

Class ACARINA *Diplodontus despiciens, Hydrarachna globosa.*

Phylum MOLLUSCA

Class GASTROPODA *Planorbis planorbis, P. vortex, P. carinatus, Physa frontinalis.*

Class LAMELLIBRANCIATA *Anodonta cygnea, Sphaerium corneum, Dreissena sp..*

Phylum CHORDATA (VERTEBRATA)

Class PISCES *Anguilla anguilla, Gasterosteus aculeatus, Cyprinus carpio, Esox lucius, Rutilus rutilus, Leuciscus borysthenicus, Phoxinus phoxinus, Gobio gobio, Chalcalburnus chalcoides, Alburnus alburnus, Alburnoides bipunctatus, Blicca bjoerkna, Rhodeus amarus, Noemacheilus barbatulus, N. angorae, Cobitis teen/a, Gambussis affinis, Neogobius fluviatilis, N. Cephalarges..(Salmonides, from fish farms-also natural)*

Class AMPHIBIA *Rana ridibunda, Bufo calamita.*

Class AVES *Anser albifrons, A. anser, A. fabalis, A. erythropus,, Anas platyrhynchos, A. strepera, A. penelope, A. crecca, A. querquedula, A. acuta, A. clypeata, A. angustirostris, Netta rufina, Melanitta fusca, M. nigra, Bucephala clangula, Mergus albellus, Gravia arctica, G.immer, Ardea cinerea, A. purpurea, Egretta alba, E.garzetta, Ardeola ralloides, Nycticorax nycticorax, Ixobrychus minitus, Botaurus stellaris, Ciconia ciconia, C. nigra, Grus grus, Anthropoides virgo, Rallus aquaticus, Galinula chloropus.*

Class MAMALIA *Canis lupus, C. aureus, Vulpes vulpes, Sus scrota, Herpestes ichneumon, Gazella dorcas, Felis cheaus, Lutra lutra.*

THE PREPARATION OF LEECHES:

The leeches which are collected for export are caught by small groups of people of 5 or 15 collectors.

Collectors are picked by the group leaders and taken to the collecting area by some means of transport and placed into their areas and about 5

hours of work they're taken back to the center, fixed before for the leeches to be weighed and finally the leeches are bought. Collectors use plastic gloves and long boots as equipment. Collected leeches are put into sucks that are made of cotton.

Catching:

A catcher in the catch area wears a pair of plastic gloves and long boots and enters water in this way.

By moving the stick on the surface of the water he makes the leeches swim to origin of vibration, and by squeezing the leeches between the two fingers which he uses like a pair of scissors, gathers them into the bags fastened round his belt. When the number of the leeches swimming around decreases or the water gets less clear he does the same work a few meters

further and goes on catching by repeating the same action again and again.

The average amount of leeches, each catcher gets daily is more or less 1-1,5kgs. This amount shows variations depending on the depth of the hunting area. Both the religious reasons and the low profit due to the loss of time during catching, catchers are protected perfectly well against the attack of the leeches.

The leeches that are bought from the catchers, by **KEREVITAŞ GIDA SAN. ve TİC.**

AŞ. Are taken to the main factory building in **AKÇALAR (BURSA)** and controlled, packed and frozen as soon as they are selected and

analyzed. Frozen leeches are stored with their catch date labeled on and periodically sent to the customers in styropor boxes by air.

Export of the leeches:

Leeches has been exported from Turkey since the beginning of 1960 s. This Leeches export which used to be done alive until 1988 was started to be transported as frozen by Kerevitaş Gıda San. ve Tic. A.Ş. in 1988 depending on the work prepared by Sanofi and Kerevitaş Gıda San. ve Tic. A.Ş. together. The tendency for the leeches export as frozen has given decreasing risks that cause death mainly because of the accumulated experience of Kerevitaş Gıda San. ve Tic. A.Ş, in the frozen products. Kerevitaş

Gıda San. ve Tic. A.Ş., which exports the largest part of leeches, is the only firm that exports leeches depending on its accumulated experience and organization in catching. Besides its Leech export, Kerevitaş Gıda San. ve Tic. A.Ş. has made scientific researches on leeches and leech production-cultivation both as a company and together with other various associations and universities by sponsoring the scientific researches.

In table 1, the export ratios of live leeches are shown in figures for the periods of 1984- 1992.

	1984	1985	1986	1987	1988	1989	1990	1991	1992
RY-O-MAT	1867.85 Kg		2113.05Kg						
ANBOR		3239.45Kg							
ALTMANN				41.00Kg	20.00Kg	123.00Kg			
Dr SAWYER	634.68Kg	50.00Kg	50.00kg	172.00Kg	200.00Kg	92.00Kg	150.00Kg	97.00Kg	89.50Kg
SANOFI				2115.03Kg	2470.75Kg	513.00Kg	1429.00Kg	10.00Kg	

Table. 1. The annual ratios of alive leeches exported from Kerevitaş.

In table 2, the frozen leeches export ratios for the years 1988-1996 is shown in the same way.

As the total export, the annual leech exportation averages both alive and frozen is shown in table 3 as a graphic.

	1988	1989	1990	1991	1992	1993	1994	1995	1996
SANOFI	49.00Kg	350.25Kg	1819.50Kg	4713.00Kg	4018.50Kg	2460.00Kg	2835,00Kg	4732.50Kg	2011.50Kg

Table.2. The annual ratios of frozen leeches exported from Kerevitaş

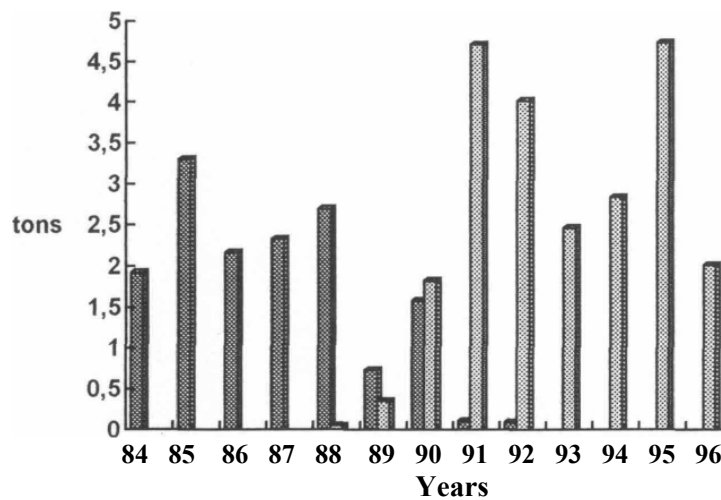


Table.3. The total exported leeches between 1984-1996 from Kerevitaş

Dark colored columns are alive exported leeches
Light colored columns are frozen exported leeches

In the figures of the total export of Turkey received from the Statistics Institute, how much export has been done depending on the estimated quota as 10 MT according to the client's demand is shown in table 4.

	1989	1990	1991	1992	1993	1994	1995
GERMANY	642Kg	304Kg	732Kg	867Kg	545Kg	445Kg	516Kg
FRANCE	2,739Kg	1,365Kg	949Kg	839Kg	679Kg	3,265Kg	2,565Kg
ENGLAND	42Kg	149Kg	97Kg	165Kg	87Kg	268Kg	330 Kg
SWISS	863Kg	3,247Kg	4,732.5Kg	4,017Kg	2,460Kg		4,750Kg
U.S.A							10Kg
TOTAL	4286Kg	5,065Kg	6,510.5Kg	5,888Kg	3,771kg	3,978Kg	8,171 Kg

Table.4.

In the comparison between the tables, the real function of Kerevitaş Gıda San. ve Tic. A.Ş. in the total export is clearly seen.

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The photos of areas are not included.

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