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CHIRONOMID RESEARCH IN THE NETHERLANDS

Bernard P.M. Krebs

Chironomid research in the Netherlands goes back to Van der Wulp, who wrote various dipterological papers, amongst others several about chironomids. In 1898 he and De Meijere published a checklist of Dutch diptera's. In recent chironomid literature we can find his name as the author of different Orthocladiinae genera, e.g. Cricotopus and Orthocladius, and different species like Pentapedilum sordens and Parachironomus monochromus. In 1928 De Meijere insisted in a paper on a revision of the Dutch Tendipedidae. Kruseman took up this gauntlet and in 1933 he published his study about the "Tendipedidae Neerlandicae". Quite different was the research of Van der Torren in the same period. He studied the midge-plagues caused by the closure and desalinisation of the Zuyderzee (now Lake Yssel). In his unpublished report he described and discussed the symptoms, the abatement and the possibility of a second outbreak of this plague.
At the end of the sixties new research was set up. The recent research can be distinguished roughly in three classes:
A) Applied systematical research for water quality and nature management,
B) Fundamental research like chironomid ecology and taxonomy,
C) Fundamental ecosystem research, of which the chironomid study is part of the whole research.

A) Due to the large numbers of species (in the Netherlands more than 4oo) and the possibilities to use the species for characterization of water quality and water economy, many research workers of (mostly) local governments, who are responsible for water quality, are making a study of the distribution and ecology of chironomid larvae (and other groups of the macrofauna) in all parts of the country. An example is the thesis of Moller Pillot (1971) in which he developed a system to characterize water quality of lowland streams by using the composition of the macrofauna. Also important is the work of Van Gijsen en Claassen (1978) in the three northern provinces of the country and the work of Van der Hammen (unpl.) in the province of North-Holland. Students research forms an essential part of this work. To meet the wishes of these workers in the applied field Moller Pillot and Krebs (1981) composed a preliminary survey of the ecology of chironomid larvae in the Netherlands. The applicability has to be proven in practice.
Contributions from nature management people are e.g. the report of Cuppen (198o) about the macrofauna of temporary and stagnant waters and the report of Cuppen and Moller Pillot (1978) about the springs in the southern part of the province of Limburg.

B) Fundamental research on chironomids forms a small part of the research in the Netherlands. Taxonomically important is the work of Moller Pillot who published in 1978/1979 a key for the larvae of the Chironomini and Tanypodinae occurring in the Netherlands with an ecological description of the species. A key to the Orthocladiinae is

in preparation, while the Tanytarsini are revised by A. Klink, who published in 1981 a key to the genera of this family for larvae and pupae.
Quite different is the research started by Parma and Krebs on the distribution and ecology of chironomids in brackish and fresh inland waters in the south-western part of the country. Besides collecting autecological data it is intended to make a classification of these waters by means of the chironomids and other macrofauna groups. In a wider context this work is fitted in with a research to the relation between the water quality and the structure of the brackish aquatic ecosystem.

A third part of the fundamental work is the thesis of Beattie (1978) "Chironomid populations in the Tjeukemeer", what was carried out on the Limnological Institute. In this work the distribution, density and production of chironomid larvae are related to the morphometry of the lake and the wind conditions during the swarming of the adult midges. Besides this Beattie studied the chironomid population in the Wolderwijd in connection with the midge plagues in the neighbouring city of Harderwijk (1981).

C) Higler and Repko of the Research Institute for Nature Management studied the figuring of chironomids in Stratiotes vegetations and their distribution inside that vegetations. They studied various other water types, such as lowland streams and so called "tichelgaten". They are also involved in the ecosystem research of "Lake Maarsseveen", carried out by the University of Amsterdam. A large number of data about larvae and adult chironomids is one of the results of this research for a characteristic lake in the central part of the Netherlands.
Detailed studies of the lowland streams in the country are carried out by the hydrobiological department of the Agricultural University in Wageningen. The thesis of Tolkamp (198o) "Organism-substrate relationships in lowland streams" is one of the results of this research. In this thesis the microdistribution of various, for lowland streams characteristic chironomids, was studied.
At the end of the work Van der Velde of the Katholic University of Nijmegen has to be mentioned. As part of his research he studied the decomposition of leaves of Nymphoides peltata by Cricotopus trifasciatus.

With this list I hope to have given you a impression of the present chironomid activities in the Netherlands. Though many work is done, there are yet many white spots. For example the chironomid fauna of little, eutrophic, isolated pools as dunepools is hardly known. Especially many taxonomical and ecological research has to be done for a translation of the occurrence of chironomids larvae into a biological water quality assessment.

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CHIRONOMID COMMUNITIES OF BRACKISH INLAND WATERS

Bernard P.M. Krebs

At the conference on brackish waters in Venice in 1958 a classification for brackish waters was adopted (Anonymus, 1959), which is now well known as the Venice system. A drawback of this classification is, that it is only based on the chloride content of the water. It is questionable to apply this system to brackish inland waters where irregular seasonal influences (e.g. rainfall) occur. To meet this problem a classification of brackish inland waters was originated, based on the composition of the chironomid communities. Only own observations of the brackish inland waters of the south-western Netherlands were included. Therefore the classification presented in this contribution has to be considered as a preliminary one.

The chironomids occurring in these communities can be divided into three groups:

1. freshwater species with a distribution optimum in fresh waters; they occur in brackish water only at very low densities or are completely absent (e.g. Ablabesmyia spec. and Dicrotendipes lobiger).
2. freshwater species which are characterized by a tolerance to brackish waters, but with a distribution optimum in fresh waters (e.g. Chironomus piger, Glyptotendipes barbipes and Cricotopus ornatus).
3. typical brackish water species with a distribution optimum in brackish waters (Chironomus halophilus, Halocladius varians, Chironomus salinarius). Some species of this group show some tolerance to fresh waters (e.g. Microchironomus deribae).

The basis of the presented system, which is made up of six classes, is the change in dominance of the chironomid species with increasing salinities. Due to the absence of clearly dominant species in class A, this class was characterized in another way.

Each class is characterized by constant species and secondary species. Constant species are very common species; secondary species are species which are also characteristic for the community, but are less common due to additional environmental requirements (e.g. with regard to the vegetation structure, substrate composition, size of the water sheet, general waterquality etc.). For example with regard to class A the secondary species are mainly determined by environmental parameters like the type of vegetation and the substrate composition. In classes B-F the chloride level is the key factor, determining the occurrence of the chironomid species. The overall water quality contributed also to the tolerance of the species to brackish waters. At better water qualities the tolerance to higher salinities increases.

The basis of the classification is the combination of species. Some species dominate the whole community. For a proper determination of the dominant and secondary species a fair number of larvae is required. Due to determination problems with chironomid larvae, it is advisable to set up some cultures from each sample.

The description of the six classes, ranged according to increasing salinities, is presented below. In this scheme the dominant species are underlined.

<u>Class A[a]</u>

Constant species	Secondary species
Chironomus piger	Parachironomus arcuatus
Chironomus annularius	Endochironomus spp. (except tendens?)
Chironomus plumosus	Cryptochironomus spp.
Chironomus luridus	Glyptotendipes pallens
Chironomus thummi	Polypedilum nubeculosum
Glyptotendipes barbipes	Dicrotendipes spp. (except pallidicornis)
Glyptotendipes spec.	Pentapedilum uncinatum
Camptochironomus pallidivittatus	Ablabesmyia spp.
Procladius choreus	Xenopelopia nigricans
<u>Psectrotanypus varius</u>	Cricotopus intersectus
Cricotopus ornatus	Acricotopus lucens
Cricotopus sylvestris	Corynoneura spp.

The freshwater habitat is characterized by a great number of chironomid species with an abundant occurrence. A number of these species are typically limnetic, whereas the other species are limnetic with some tolerance with regard to chloride. Besides chloride a number of other environmental factors (e.g. vegetation) influences the structure of the chironomid community. Consequently a clear dominance of certain species cannot be demonstrated. Two species are regarded as distinctive: Psectrotanypus varius and Cricotopus sylvestris. Both species are known from fresh and oligohaline waters. In the Delta area of the south-western Netherlands these species occur up to a chloride content of 1 °/oo Cl^-. Cricotopus sylvestris has been found up to a maximum of 1.56 °/oo Cl^- and P. varius up to 2.4o °/oo. At about 8o % of the sampling stations where these species were found, the chloride level was lower than o.5 °/oo Cl^-.

Besides the constant species a number of less common species, which are specific for fresh waters, can be found, e.g.Xenopelopia nigricans, Corynoneura spp., Pentapedilum uncinatum and Ablabesmyia spp. In somewhat larger waters Glyptotendipes pallens and Polypedilum nubeculosum occur. All these species point clearly to freshwater conditions.

Water quality influences the community composition. A lower water quality results in a disappearance of Dicrotendipes lobiger, Pentapedilum uncinatum and Endochironomus dispar/impar.

Class A^b

Constant species	Secondary species
Chironomus piger	Parachironomus arcuatus
Chironomus annularius	Cryptochironomus spp.
Chironomus plumosus	Glyptotendipes pallens
Chironomus luridus	Chironomus halophilus
Glyptotendipes barbipes	Microchironomus deribae
Glyptotendipes spp.	Cricotopus sylvestris
Camptochironomus pallidivittatus	Cricotopus intersectus
Procladius choreus	
Psectrotanypus varius	
Cricotopus ornatus	

As a result of an increasing influence of oligohaline water, a large number of secondary species of Class A^a disappear, without affecting the composition of the group of constant species. Some representatives of the brackish water fauna appear as secondary species (Microchironomus deribae and Chironomus halophilus). Class A^b represents the transition from Class A^a to Class B, by which the group of constant species is similar to that of Class A^a.

Class B

Constant species	Secondary species
Chironomus halophilus	Chironomus luridus
Chironomus annularius	Parachironomus arcuatus
Chironomus piger	Camptochironomus pallidivittatus
Chironomus plumosus	Glyptotendipes pallens
Chrionomus salinarius (secondary species?)	Glyptotendipes sp.
Glyptotendipes barbipes	Tanypus punctipennis
Microchironomus deribae	Cricotopus intersectus
Procladius choreus	
Cricotopus ornatus	

This class includes many species which are specific for Class A. Characteristic of Class B is the nearly total missing of Cricotopus sylvestris and Psectrotanypus varius as a result of the increase of the chloride level. Chironomus piger, Ch. annularius and Ch. plumosus are the dominant species of this class. Chironomus thummi occurs only in Class A. As the other freshwater constant species, Glyptotendipes barbipes, Procladius choreus and Cricotopus ornatus have to be mentioned.
Of the brackish water species Microchironomus deribae and Chironomus halophilus belong to the constant species. A dominance of Ch. halophilus is possible; then the numbers of Ch. piger and/or Ch. annularius/plumosus are also high.

It may be better to classify Ch. salinarius as a secondary species. The position of Tanypus punctipennis within the system is not quite clear. It seems most reasonable to include this species into Class B.

At lower water qualities many species disappear from the group of secondary species, e.g. Ch. luridus and P. arcuatus. The same phenomenon is observed at an increasing salinity. Then Ch. salinarius and Ch. plumosus exchange their positions. Ch. salinarius becomes a constant species and Ch. plumosus a secondary species.

Class C

Constant species	Secondary species
Chironomus halophilus	Chironomus plumosus
Chironomus salinarius	Chironomus piger
Microchironomus deribae	Chironomus annularius
Glyptotendipes barbipes	Procladius choreus
	Cricotopus ornatus
	Halocladius varians

With respect to the species composition there are remarkable differences between Class B and Class C. First of all Chironomus halophilus is now the dominating species. The other constant species are Chironomus salinarius, Microchironomus deribae and Glyptotendipes barbipes. Dominating species of Class B, like Chironomus annularius, Ch. piger, Ch. plumosus, Cricotopus ornatus and Procladius choreus are the secondary species of Class C. The secondary species of Class B like P. arcuatus, T. punctipennis, Ch. luridus, G. pallens, C. pallidivittatus, C. intersectus and C. sylvestris disappeared. The brackish water species Halocladius varians enters Class C as a newcomer, although with low population densities.

Class D

Constant species	Secondary species
Chironomus salinarius	Chironomus annularius
Chironomus halophilus	Microchironomus deribae
Glyptotendipes barbipes	Procladius choreus
	Cricotopus ornatus
	Halocladius varians

Instead of Ch. halophilus, Ch. salinarius is now the dominant species and Ch. deribae changes from a constant species to a secondary species. The other secondary species are the same as those of Class C, but their population density in Class D is lower. However Halocladius varians presents an exception; it is not quite clear whether this species must be classified as a constant species or as a secondary species. Moreover it is possible that also G. barbipes has to be considered as a secondary species of this class.

Class E

Constant species	Secondary species
Chironomus salinarius	Chironomus halophilus
Halocladius varians	Glyptotendipes barbipes

In this class Ch. salinarius and H. varians are the constant species. Ch. halophilus occur very scarcely. The difference between Class E and F is often obscure, due to less favourable environmental conditions. The absence of Ch. halophilus can be caused by more environmental factors than only by an increasing chloride level.

Class F

Constant species	Secondary species
Chironomus salinarius	
Halocladius varians	

Class F comprises only two constant species, Ch. salinarius and H. varians. There are no secondary species. This community composition occurs also at greater stagnant brackish or marine environments like for instance the saline lake Grevelingen in the S.W.Netherlands.

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AN ANNOTATED LIST OF SPECIFIC NAMES WHICH HAVE BEEN REFERRED TO THE GENUS CHIRONOMUS

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I have compiled a computer listing which attempts to bring together all the names which have been referred to the genus Chironomus, with useful additional information. Names in the list are divided into three categories indicated by a prefix:

- Names of species or varieties currently considered to be in the genus Chironomus (s.s.) but including also Camptochironomus, Chaetolabis and Einfeldia. These are included because there is either some dispute over whether they are genera or subgenera, or as to whether some of the species should in fact be in Chironomus (s.s.).
- Names of species which are now placed in other genera.
- Species names which are of uncerta in status.

For each listing the information is arranged as follows:

Line 1. Species name. A number in front of the name indicates that the same name has been used by more than one author.

Line 2. Present position, i.e. synonymy or another genus followed by either the authority who made the change or the source of the information.

Line 3. Original describer, date (where known) and the original genus in which it was placed if this was not Chironomus.

Line 4. Distribution and type locality if known.

Line 5. References by other workers to this species.

References follow Fittkau, E.J., Reiss, F., and Hoffrichter, O. "A bibliography of the Chironomidae" Gunneria 26: 1-177 (1976)
- except of course for more recent references.

A copy of this listing may be obtained on request, either in full or broken down into one or more of the three major categories.

REQUEST FOR INFORMATION ON THE BIOLOGY OF FLEURIA LACUSTRIS KIEFFER

In a newly formed inshore lake (lagoon) in Denmark Fleuria lacustris has been a nuisance for some years. In order to find a way to control it, all available information on its biology (especially on distribution, abundance, duration of periods with mass-emergence, salinity range of habitats) would be greatly appreciated.

Information should be addressed to: Dr.Claus Lindegaard, Freshwater Biological laboratory, Helsingørsgade 51, DK-34oo Hillerød, Denmark.

CHIRONOMID HEMOGLOBIN - A MAJOR ALLERGEN FOR HUMANS

X. Baur

Pulmonologische Abteilung (Leiter: Prof.Dr.G.Fruhmann), Medizinische Klinik I (Direktor: Prof.Dr.G.Riecker) des Klinikums Großhadern der Universität München.

Chironomid larvae (rote Mückenlarven, Chironomus sp.) are widely used as fish food either in form of whole lyophilized insects or as components in homogenized mixed products.

Handling of such dried foods leads to inhalation of airborn constituents. During the last two years 5 pet-fish owners consulted our outpatient department because of severe asthmatic attacks upon contact with such fish food products. Therefore, an announcement was published in two pet-fish journals concerning observations of similar hypersensitive reactions (1o). 32 persons responded, also reporting shortness of breath, wheezing, rhinitis, conjunctivitis, wheal and flare reactions upon contact with dried chironomid larvae. In addition we studied 63 workers engaged in production of fish food as well as 5 co-workers of a research laboratory where chironomid hemoglobins were investigated.

Of these 1o5 individuals 48 had symptoms suspective of an immediate type (type I) hypersensitivity to these insects.

The sera of 1oo of these individuals were available for measurement of specific IgE and IgG antibodies by the radioallergosorbent test (RAST). Using extracts of commercially available chironomid larvae, extracts of larvae of Chironomus thummi thummi (CTT) as well as highly purified protein fractions of the latter species we were able to detect highly significant levels of IgE antibodies to chironomid hemoglobin in the sera of 33 out of 43 symptomatic and of 1 out of the 57 asymptomatic persons. Of special interest is the finding of strong antigenic activities of all of the 11 known and sequenced CTT hemoglobins. Specific IgG antibodies were detected in only some of the sera; they were not correlated with clinical sensitization.

In vivo antigenicity of CTT hemoglobins was demonstrated by skin testing which produced immediate type wheal and flare reactions in clinically sensitized subjects. Furthermore, inhalative provocation challenge by as little as o.2 ug of the isolated hemoglobin CTT VI resulted in a typical asthmatic attack (3). On the other hand, all chironomid fractions not containing hemoglobin molecules were antigenically negative in vivo and in vitro.

Enzymatic and chemical cleavage of two of the homologous hemoglobins let to localisation of antibody binding sites (antigenic determinants) within the peptide sequences 1-31, 32-9o, 91-1o1 of the monomeric hemoglobin CTT IV and within the sequence 64-9o of the dimerous hemoglobin CTT VI (2, 3) (this experiment was performed in cooperation with Dr.H.Aschauer and Dr.J.Pfletschinger, Max-Planck-Institut für Biochemie, Martinsried; 1, 4, 5, 9).

Our latest experiments show that there exist immunological crossreactivity between larvae of different species of Chironomidae. In addition, it could be shown that larvae and midges of several species have common antigenic determinants. This was demonstrated by radioimmunological methods for estimation of specific antibodies as well as the inhibition of antibody binding with the putative crossreacting antigens.

Furthermore, the serum of a laboratory worker who was sensitized to CTT hemoglobins was shown to contain antibodies specific to an extract of Cladotanytarsus lewisi midges, a genus relatively closely related to Chironomus. Besides, the sera of two Sudaneze people sensitized to midges of Cladotanytarsus lewisi and suffering from bronchial asthma contained high titres of CTT hemoglobin-specific antibodies.

These findings suggest that increasing asthmatic diseases reported in some water-rich areas during the chironomid season (6, 7, 8) is based on IgE-mediated hypersensitivity to chironomid hemoglobins or its antigenically active fragments.

The immunogenic property of these polypeptides may play an important clinical role in connection with the worldwide prevalence of these insects.

In summary, we were able to demonstrate that hemoglobins of chironomids are potent allergens in man, causing type I allergic reactions in a high percentage of the exposed individuals. Therefore, chironomids must be considered in relation to environmental and occupational sensitization contributing to respiratory diseases. Localisation of antigenic determinants within well-defined peptide sequences of chironomid hemoglobins was established.

We are interested in further experiments concerning the above mentioned allergic disease; so we would be glad receiving sera of sensitized persons as well as samples of defined chironomid species (larvae and/or midges).

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ITEMS

Mrs. Nancy Kirsch (see "addresses") is conducting a revision of the Nearctic species of Microtendipes under the direction of Dr.Edwin Cook at the University of Minnesota. She would be interested in seeing all life history stages or adults of both Nearctic and Palearctic species.

Bohdan Bilyj, Head Taxonomist, Freshwater Institute, 5D1 University Crescent, Winnipeg, Manitoba, R3T 2N6, Canada, is conducting a taxonomic revision of the Holarctic species of Larsia and Guttipelopia. He would appreciate receiving specimens in any life stage.

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February 08, 1982

Dear Colleagues:

You are cordially invited to attend and participate in VIII th International Symposium on Chironomidae at Jacksonville University, Jacksonville, Florida, July 26-28, 1982.

Housing is available in the University dormitories at a rate of 25 dollars per day for room and three meals. A number of rooms have also been reserved at the Thunderbird Motel which is quite close to Jacksonville University; these rooms are available at 34 dollars per day, single or double occupancy. There is a six percent resort charge added to the basic rate. Motel reservations should be made by June 1st. The address is: Thunderbird Motel, 5865 Arlington Expressway, Jacksonville, Fl 32211.

It is recommended that you, especially foreign visitors, arrive in Jacksonville by July 25th since the symposium will open at 9 a.m. on July 26th. Transportation from the airport is available by limousine to either the University or the Thunderbird. A registration desk will be open in the Gooding Building on the Campus of Jacksonville University all day on July 25th, as well as during the entire symposium.

We will need to know of your attendance and participation by May 15th if possible. For those of you giving talks, a title and abstract should be submitted by the same date.

We feel that you will be very pleased with the facilities and hospitality of Jacksonville University.

It is recommended that money be exchanged at your airport of entry to the United States. We hope that we can have arrangements for exchange of money locally, but it will be more difficult here.

An excursion is planned following the symposium to the Okeefenokee Swamp and Wakulla Springs, a bird sanctuary and wildlife preserve. We will leave Jacksonville University by bus the morning of July 29th and return around noon on July 31st. This trip will be at each individual's expense. The cost for the trip will be approximately $60 plus meals.

Please feel free to call us at our home if you have any difficulties on arrival. Our telephone number is area code (904), telephone number 743-4482.

We look forward to welcoming you.

William M. Beck, Jr., and
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