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Notes on life cycles of semiaquatic and aquatic Heteroptera in Northern Tyrol (Austria) (Insecta: Heteroptera)

by

Nico NIESER *)

(Laboratory for Zoological Ecology and Taxonomy State University, Utrecht)

Bemerkungen zu Lebenszyklen semiaquatischer und aquatischer Heteropteren in Nordtirol (Österreich) (Insecta: Heteroptera)

Synopsis: Die aquatielen und semiaquatielen Wanzen von 16 Lokalitäten in Nordtirol wurden bei vier Besuchen im Jahre 1979 studiert. Für die meisten Arten sind folgende Populationsparameter notiert: Flügelausbildung, Zustand der indirekten Flugmuskulatur, die An- oder Abwesenheit von Eiern oder sich entwickelnden Oozyten und die Härte des Chitins.

Neue Arten für Nordtirol sind *Mesovelia furcata* (MLS. & REY), *Micronecta griseola* HORV. und *Sigara longipalis* (SAHLB.). Alle Exemplare von *Notonecta lutea* MÜLL. hatten degenerierte Flugmuskulatur. Bei den Gerriden wird konstatiert, daß bei den meisten Arten Fortpflanzungspopulationen eine geringere Verbreitung in Höhenlagen haben, als man von der Literatur her erwarten würde. Zwei Arten, *Gerris lacustris* (L.) und *G. odontogaster* (ZETT.) sind ziemlich weit verbreitet in Höhenlagen und weisen in niederen Lagen bivoltine und in mittleren Höhen univoltine Populationen auf.

Introduction:

Studies on life cycles and related topics of European and N. American semiaquatic and aquatic Heteroptera are at present quite frequent. In Europe we have, a.o. the work of YOUNG (1965a, b) and VEPSÄLÄINEN (1974a, b). The observation by VEPSÄLÄINEN (1974) that some species of *Gerris* are bivoltine in S. Finland and/or Danmark but univoltine in N. Finland gave rise to the present study. The initial problem to be studied was: are there *Gerris* species in mountainous regions which have bivoltine populations at low and univoltine populations at higher altitudes. The region of Tyrol was chosen because it is relatively close to Utrecht and moreover Dipl.Ing. E. Heiss (see HEISS, 1969) was to kind to offer help with the selection of habitats and much other advise, for which I give my sincere thanks here. The field trips were made possible by a grant (N° 146.100-0040) from the State University at Utrecht.

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*) Anschrift des Verfassers: Dr. N. Nieser, Laboratorium voor Zoölogische Oecologie en Taxonomie, Plompetorengracht 9 - 11, NL-3512 CA, Utrecht, Nederland.

Methods:

A number of previously selected habitats were visited four times during spring and summer 1979. In each habitat a number of abiotic parameters was measured and water bugs were collected with a pond net.

PO_4^{3-} and NH_4^- were measured by a crude method and always found to be less than 1 mg/l. In the descriptions conductivity is expressed in μmhos: cm; temperature in °C; Ca-hardness in mg $CaCO_3$/l, Mg-hardness also in mg $CaCO_3$/l and other chemical parameters in mg/l (ppm).

Collecting was not standardized. Most specimens taken were killed and stored in 80 % alcohol and studied in the laboratory where a number of conditions of the animals was noted as: development of indirect flight muscles, wing polymorphism, egg or oocyte development. The distributional data have been incorporated in ZOODAT, the Austrian branch of E.I.S.

Abbreviations and codes:

apt.	apterous, wings not visible from the outside, in *Gerris* very small stumps may be present under the pronotum.
micr.	micropterous, wings visible but not reaching beyond tergite 2.
brach.	brachypterous, wings not fully developed, they may be clearly reduced as in *Gerris paludum.* or *G. lacustris* or only shorter and narrover than in the fully developed form as in *G. costai* and *G. gibbifer.*
macr.	macropterous, wing fully developed, see LW and SW.
LW	"long winged" macropterous specimen with fully developed indirect flight muscles.
SW	"short winged" macropterous specimens with non-functional indirect flight muscles, unable to fly. Non-macropterous specimens are always in the category SW.
lv	larva.
mesal	mesoalinotum, dorsal part of the thorax covering the flight muscles, mostly covered by the pronotum which is to be lifted to see the mesal.
roman numerals	1) month of the year; 2) in combination with lv, the number of the larval instar, in this study the instars 1 - 3 have not been differentiated; 3) in combination with mesal indicating the stage of colouration of the mesalinotum as described for *Gerris* by ANDERSEN (1973) and for Corixidae by YOUNG (1965a, b). In both cases mesal I, II means hardly coloured, indicative for a freshly moulted specimen in which indirect flight muscles are hardly developed. VI in Corixidae and IV in *Gerris* indicates fully developed pigmentation.
eggs++	fully developed eggs present.
eggs+	only one or two developed eggs present.
eggs–	no developed eggs (nor developing oocytes) observed.
ooc+	developing oocytes present.
ooc–	no developing oocytes (nor developed eggs) observed.
soft	specimen which has just moulted.
± soft	recently moulted specimen, hardening of chitin not yet completed. The abdomen will not collapse during storing but can be easily depressed by a needle or forceps.
± hard	functional hardening completed, a small depression can be made on the abdominal venter with a needle or forceps but it will disappear as soon as the pressure is relieved.
hard	abdomen very hard, and often brittle, the chitin will crack when pressed before a depression appears. This condition is typical for overwintered specimens although some of these are ± hard. The ± hard condition is typical of fully developed specimens of the (eventual) summer generation and diapausing specimens at the end of the season before overwintering.
alt.	altitude.

Description of sites, all are in Austria, Tyrol and have been visited in 1979:

N7902. Kramsach, Berglsteinersee, alt. ca. 700 m, area ca. 30.000 m^2, depth of sampled edge 0.25 m. Sample taken in reed beds near the mouth of a small streamlet entering the lake. Velocity of current not perceptible at actual sampling sites. Bottom with a thick layer of fine plant debris slowly and evenly slanting into the lake, no aquatic vegetation, no shade from trees. pH 8.1 - 8.3; conductivity 350 - 400; Ca 180 - 190; Mg 80 - 90.

		a	b	c
	29.V. (11.00 h)	3.VII. (12.00 h)	31.VII. (14.00 h)	26.VIII. (14.00 h)
temperature of streamlet	14	9		
temp. of water at side	14 - 20	14	19	10 - 15
temp. of air			18	14
cover by helophyta	0.1	0.5	0.5	0.5
free O_2	$7\frac{1}{4}$	$8\frac{1}{2}$	$9\frac{1}{2}$	10
CO_2	$\leqslant 2\frac{1}{2}$	$\leqslant 2\frac{1}{2}$	$\leqslant 2\frac{1}{2}$	$\leqslant 2\frac{1}{2}$

N7902A. As N7902 margin of lake shaded by trees, little or no aquatic vegetation and helophyta, some grasses hanging over from the banks.

N7903. Kramsach, Krummsee, alt. ca. 600 m, area of sampled arm about 1.000 m^2, depth of sampled edges 0.25 m. Sample taken in an along *Carex*-beds with some *Phragmites* near the connection with the Reinthalersee. Beds of *Carex* towards the centre replaced by fields of *Nymphaea,* on the leaves of with *Gerris paludum* frequently rests. Stagnant, bottom loam with some stones and a thin layer of plant debris, no aquatic vegetation. Edges irregular, small holes between tufts of *Carex,* some small stands of *Alnus* providing shade locally, *Gerris* not showing preference for shade. pH 7.9 - 8.2; conductivity 320 - 400; Ca 110 - 150; Mg 50 - 100.

		a	b	c
	29.V. (14.00 h)	3.VII. (14.00 h)	1.VIII. (15.00 h)	26.VIII. (14.00 h)
temperature, water	24/25	15	18	17
temperature, air			18	14/15
cover by helophyta	0.3	0.4	0.5	0.5
free O_2	$8\frac{1}{4}$	9	9	9
CO_2	5	3	$\leqslant 2\frac{1}{2}$	$\leqslant 2\frac{1}{2}$

N7904. Kramsach, Reinthaler See, alt. ca. 600 m, area of sampled edge 400 m^2, near small streamlet, partly open, partly grown with *Carex* and *Phragmites*, partly bordered with shrubs. Depth of sampled area 0.25 - 0.50, apart from the immediate vicinity of the mouth of the streamlet, stagnant, bottom gravel near streamlet, elsewhere mud with plant debris, bottom evenly and gradually slanting, water's edge regular. pH 7.9 - 8.3; conductivity 320 - 430; Ca 120 - 130; Mg 80 - 110.

	29.V. (16.00 h)	3.VII. (17.00 h)	31.VII. (15.30 h)	27.VIII. (18.00 h)
temperature, water	23	14	21	14
temperature, air			19	12
free O_2	9	9	$9\frac{1}{2}$	9
CO_2	$\leqslant 2\frac{1}{2}$	$\leqslant 2\frac{1}{2}$	$\leqslant 2\frac{1}{2}$	
cover by helophyta	0.3	0.8	0.8	0.8

Micronecta near entrance of streamlet on bare sand/gravel, *Gerris* not in the *Carex/Phragmites* field, on 29.V. alongside it, 3.VII. and later predominantly at the other side under overhanging branches of trees, perhaps because that part was less disturbed by bathers.

N7905. Kramsach, Frauensee, alt. 600 m, area about 15.000 m^2, sampled near the entrance of a small enclosed streamlet alongside and in a bed of *Phragmites* with some *Carex*, depth of sampled area up to 0.5 m. In the reedbeds Characeae. Apart from the immediate vicinity of the entrance of the streamlet, stagnant, bottom sand with little plant debris alongside, and muddy with plant debris inside the reedbed. Edge artificially steep near entrance of streamlet, elsewhere slowly and evenly slanting. Trees providing shade at one side but *Gerris* when undisturbed in low numbers there. pH 7.3.-7.9.; conductivity 410-500; Ca 180-210, Mg 90-100.

		a	b	c
	29.5. (17.30 h)	3.VII. (14.00 h)	1.VIII. (17.00 h)	27.VIII. (18.00 h)
temperature, water	20/22	11/12	20	11/12
air			24	13
O_2	8 ½	9 ½	10	9
CO_2	10	10	3	5
helophyta, cover in reed bed	0.1	0,2	0.2	0.2

N7906. Seefeld, Lottensee, temporary water on alm (meadows), alt. 1300 m, area about 4.000 m², depth of sampled area 0.25 m. Stagnant, bottom submerged meadows, edges evenly and slowly slanting, no true aquatic vegetation, no helophyta and no shade.

		a	b	c
	30.V. (15.00 h)	5.VII. (17.00 h)	2.VIII. (19.30 h)	27.VIII. (18.00 h)
temperature, water	23/26	14/15	22	14 ½
air			26	14
free O_2	8 ½	8 ½	11	9 ½
CO_2	0	0	0	0

pH 7.0-8.0; conductivity 250-300; Ca 100-130; Mg 60-70.

N7907. Seefeld, Wildmoossee, peatpond, alt. ca. 1300 m, area 10.000 m², depth of sampled area 0.25 m. Stagnant, bottom peaty, soft, edges evenly slanting. Submerged vegetation 0.5, no shade. pH 7.8-8.7; conductivity 160-230; Ca 80-100; Mg 40-70.

		a	b	c
	30.V. (15.00 h)	5.VII. (17.00 h)	2.VIII. (19.30 h)	27.VIII. (18.00 h)
temperature, water	26/27	14/18	23	14
air			25	11 ½
O_2	9 ½	10	7 ½	8 ½
CO_2	0	⩽ 2 ½	0	⩽ 2 ½
Potamogeton (floating)		0.1	0.9	0.9

N7908. Seefeld, waterhole near railroad, alt. ca. 1200 m, area 2.500 m², sample taken in and along small beds of *Equisetum* and *Carex* flanking the entrance of a small mountain stream. Depth up to 0.5 m, stagnant, bottom gravel and loam, hardly any plant debris, edges evenly slanting, not steep at sample site, elsewhere steep and artificial, no shade of shrubs or trees. pH 7.8 - 9.3; contuctivity 160-220; Ca 40-110, Mg 40-70.

		a	b	c
	30.V. (16.30 h)	6.VII. (9.30 h)	2.VIII. (10.30 h)	27.VIII. (16.15 h)
temperature, water	18	10/12	22	11 ½
air			27	16
free O_2	9 ½	7	11	8 ¼
CO_2	0	⩽ 2 ½	0	⩽ 2 ½
helophyta	0.1	0.6	0.8	0.8

N7910. Semiartificial pond in the Schwemm near Walchsee, pond surrounded by tufts of *Carex*, in an part of the marsh with low vegetation, alt 660 m, area 400 m², depth of sampled area 0.25 -

0.5 m. Stagnant, bottom sandy with plant debris, edges steep, probably artificial. Submerged vegetation of *Potamogeton*, in the pond *Nymphaea*, edges with *Carex*. pH 7.0 - 7.8; conductivity 200 - 400; alkalinity 100; CaO 70 - 180, MgO 10 - 50.

		a	b	c
	31.V. (11.00 h)	2.VII. (13.00 h)	30.VII. (9.00)	25.VIII. (9.00 h)
temperature, water	24	16	21	14
air				10
O_2	6	4	6	7
CO_2	$12\frac{1}{2}$	25	5	
Carex	0.1	± 1	± 1	± 1
Nymphaea		0.1	0.2	0.3
Potamogeton	0.1	0.2	0.3	0.3

N7911. Puddle in Phragmites in the Schwemm, alt. 660 m, area 20 m^2, depth 0.5 m, stagnant, bottom much plant debris, some patches of Chlorophyta. Thick vegetation of *Phragmites* providing shade except at first visit when the *Phragmites* was still young. Second and later visits some strands of *Utricularia*, Chlorophyta declining. pH 6.3 - 6.9; conductivity 170 - 220; Ca 90 - 120; Mg 10 - 20.

		a	b	c
	31.V. (13.00 h)	2.VII. (11.00 h)	30.VII. (10.00 h)	25.VIII. (10.00 h)
temperature, water	15/20	14	16	12
air				$9\frac{1}{2}$
O_2	1	1	$1\frac{1}{4}$	2
CO_2	65	$37\frac{1}{2}$	8	

N7912. Pool in *Phragmites* bed in the Schwemm, alt. 660 m, area 150 m^2, depth 1 m, stagnant, bottom fenny, some patches of Chlorophyta at first visit, at subsequent visit these virtually gone. Second and later visits some strands of *Utricularia* and *Phragmites* providing ampe shade. pH 5.9 - 6.9; conductivity 150 - 200; Ca 90 - 100; Mg 10 - 20.

		a	b	c
	31.V. (14.00 h)	2.VII. (10.00 h)	30.V!I. (9.00 h)	25.VIII. (9.00 h)
temperature, water	21	$13\frac{1}{2}$	16	12
air				$9\frac{1}{2}$
O_2	8	$1\frac{1}{4}$	2	3

N7913. Längsee near Kufstein, area about 50.000 m^2, alt about 620 m. Sampled at an edge with *Carex* in the shade of trees, depth 0.1 m, and a more open place with some boulders (*Gerris paludum*), depth over 1 m. Stagnant, under the trees bottom peaty, edges irregular, towards the lake the peat is nearly vertically broken of. pH 7.9 - 8.9; conductivity 220 - 270; Ca 90 - 120; Mg 10 - 40.

		a	b	c
	31.V. (16.00 h)	2.VII. (15.00 h)	30.VII. (13.00 h)	25.VIII. (13.00 h)
temperature, water	24/25	16	21	16/17
air			23	10/11
O_2	3	$9\frac{1}{2}$	$8\frac{1}{2}$	7
CO_2	$< 2\frac{1}{2}$	$\leqslant 2\frac{1}{2}$	$\leqslant 2\frac{1}{2}$	$\leqslant 2\frac{1}{2}$

Temperature at 31.V. 24/25 in upper layer, deeper layers of lake distinctly colder.

N7914. Wildmoossee near Aschau, alt. about 1.050 m, area 950 m^2. Stagnant, depth of sampled area 0.5 m (max. depth of pond 1 m), bottom partly pebbles, partly loamy plant debris, edges evenly slanting. At first visit at places *Ranunculus* on the bottom giving about 0.5 cover, at one edge *Carex*, giving 0.5 cover. At second and subsequent visits the *Ranunculus* was cleaned out but other submerged plants still gave 0.5 cover locally, most of the pond now bordered by *Carex* 0.2/0.3, at places tufts with 0.8 cover. pH 8.1 - 8.7; conductivity 200 - 260; Ca 100 - 120; Mg 30 - 70.

		a	b	c
	2.VI. (11.00 h)	4.VII. (14.00 h)	1.VIII. (11.00 h)	25.VIII. (7.00 h)
temperature, water	23	13	18	13/14
air			18	$12\frac{1}{2}$
O_2	8	8	8	$8\frac{1}{4}$
CO_2		$\leqslant 2\frac{1}{2}$	$\leqslant 2\frac{1}{2}$	$\leqslant 2\frac{1}{2}$

N7915. Ditch along the railroad at Radfeld, alt. 500 m, width 5 m, depth up to 1 m. Stagnant, bottom sandy with much plant debris, edges evenly slanting, artificial. Actual site partly shaded by *Salix*, partly open, tufts of *Carex*. pH 7.0 - 7.6; conductivity 330 - 520; Ca 180 - 200; Mg 40 - 100.

		a	b	c
	2.VI. (16.00 h)	4.VII. (18.00 h)	30.VII. (16.00 h)	26.VIII. (17.00 h)
temperature, water	23	$11\frac{1}{2}$	19	14
air			25	17
O_2	$5\frac{3}{4}$	$3\frac{1}{4}$	6	$6\frac{3}{4}$
CO_2	15	20		$7\frac{1}{2}$
Carex cover under *Salix*	0.1	0.2	0.5	0.5
in the open	0.4	0.8	0.9	0.9

N7916. Obernbergersee, mountain lake of considerable extent, alt. 1600 m, bottom at most places rocky, at some places marshy, clear oxygen-rich water. It was visited all four times but no aquatic or semiquatic bugs were observed in the 1979 season. According to Heiss (personal communication) they have been found there occasionally.

N7917. Puddle near Zireiner See, alt. 1800 m, area 70 m², in peat with a layer of grass. Some small tufts of *Callitriche* at edges, depth up to 0.5 m, bottom soft peat, edges softly slanting. Due to climatological conditions this site was visited only at 31.VII. and 25.VIII. Only on 31.VII. a few *Gerris* were taken. Measurements, except for temperature were taken on 31.VII. only: pH 8.0; Ca 80; Mg 30; O_2 8; CO_2 about $2\frac{1}{2}$; temperature water 13, air 16. On 25.VIII. temperature water 8, air 10.

Corixidae LEACH:

Micronecta poweri (DOUGLAS & SCOTT), 1869:

M. poweri; WRÓBLEWSKI 1958: 305 - 324; HEISS 1969: 110; TAMANINI 1979: 99.
N7902 9 ♂, 2 ♀ eggs–, all brach., 1 lvV.

Micronecta griseola HORVÁTH, 1899, new for North Tyrol.

M. griseola; WRÓBLEWSKI 1958: 287 - 305; TAMANINI 1979: 99 - 100.
N7903 4 ♂, 3 ♀ egg++, 1 ♀ eggs–; N7904 17 ♂ of which 1 soft, 5 ♀ eggs++, 2 ♀ eggs–; N7904a 41 ♂, 34 ♀ eggs++; N7905 1 ♀ eggs++, 2 ♀ eggs– all brach.

M. griseola is said to have two generations each year in Poland (WROBLEWSKI 1958) contrary to *M. poweri* which usually has only one, this in spite of *M. poweri* developing somewhat earlier in spring. Which conditions prevail in N.Tyrol is to be specified.

Cymatia coleoptrata (FABRICIUS), 1776:

C. coleoptrata; POISSON 1957: 54 - 55; HEISS 1969: 11.
N7910 5 ♂, 3 ♀ eggs++; N7910a 1 ♀ eggs++, 2 lvV (1 ♂, 1 ♀); N7910b 1 ♀ soft, eggs–, 1 lvV, 1 lvI/III; N7910c 1 ♂, 1 ♀ eggs–, 2 lvV, 1 lvI/III; N7911 1 ♂; all brach.

The Italian subspecies *C. c. concii* TAM. is said to have two generations each year (TAMANINI 1979). The ♀ from sample N7910a looks like a first generation female, so a partial second generation at least is possible.

Corixa dentipes (THOMSON), 1869:

C. dentipes; POISSON 1957: 67-69; HEISS 1969: 12; TAMANINI 1979: 73-74.
N7914a 1 lvIII; N7914b 4 lvV, 1 lvIII.

Probably one generation a year as usual in *Corixa* species.

Arctocorisa carinata (SAHLBERG), 1819:

A. carinata; POISSON 1957: 89-91; HEISS 1969: 16; TAMANINI 1979: 80.
N7907a 2 ♂ mesal VI, LW, 2 lvIV; N7907b 1 ♂ soft, 1 ♂ ± soft, 1 ♀ ± soft, mesal V, LW, ooc–, 1 lvV; N7907c 1 lvV; N7908a 1 ♂ mesal IV, LW; N7914c, 1 lvV.

Callicorixa praeusta (FIEBER), 1848:

C. praeusta; POISSON 1957: 72-73; HEISS 1969: 16-17; TAMANINI 1979: 87.
N7906a 1 lvI/III; N7906b 2 lvV, 1 lvIV, 1 lvI/III; N7906c 5 ♂, 1 ♀ mesal I/IV, LW, ooc–, 28 lvV, 16 lvIV, 4 lvI/III.

Hesperocorixa sahlbergi (FIEBER), 1848:

H. sahlbergi; POISSON 1957: 77-78; HEISS 1969: 13; TAMANINI 1979: 76.
N7911a 6 lvV; N7911b 1 ♂, LW; N7912a 2 lvV.

Sigara falleni (FIEBER), 1848:

S. falleni; POISSON 1957: 115-116; HEISS 1969: 14; TAMANINI 1979: 93.
N7907a 1 ♀ mesal IV, LW, eggs++, 1 lvIV; N7907b 1 ♂, 9 lvV, 6 lvIV, 2 lvI/III; N7907c 2 ♂ soft, mesal I, 1 ♀ mesal V, LW, ooc–, 2 lvV, 4 lvIV; N7910c 1 lvV.

Sigara longipalis (SAHLBERG), 1878, new for North Tyrol.

S. longipalis; POISSON 1957: 116-117.
N7907b 1 ♂ mesal IV, LW, 1 ♀ mesal VI, LW, eggs++; N7907c 1 ♀ soft.

The male is fresh and can be considered proof that this species bred in the Wildmoossee during the 1979 season. The two females may be rather large specimens of *S. falleni*. This species can be recognized in the male sex by the pala being distinctly larger than in *S. falleni*. *S. italica* JACZ. from N. Italy has also a large pala, it could be found in South Tyrol. The male has been placed in the collection of Ing. E. Heiss, Innsbruck.

Sigara striata (LINNÉ), 1758:

S. striata; POISSON 1957: 108-109; HEISS 1969: 14-15; TAMANINI 1979: 89-90.
N7906c 1 ♂, 1 ♀ soft, 3 lvV, 2 lvIV; N7908a 1 ♀ mesal IV, LW, eggs++; N7914b 1 ♀ soft.

Sigara nigrolineata (FIEBER), 1848:

S. nigrolineata; POISSON 1957: 104-106; HEISS 1969: 15; TAMANINI 1979: 87-89.
N7908b 1 ♂; N7914 2 ♀ LW, eggs++; N7914a 1 lvI/III; N7914b 2 ♂, 1 ♀ soft, 1 ♂, 1 ♀ mesal V, LW, ooc–, 11 lvV, 4 lvIV, 1 lvI/III; N7914c 4 ♂ mesal III, LW, 2 ♀ mesal III/IV, LW, ooc–, 8 lvV.

It seems that the Wildmoossee population has only one generation a year. YOUNG (1965) found two generations in England. It would be worth wile to compare the life histories of Tyrolian populations at various heights.

Pleidae FIEBER:

Plea minutissima LEACH, 1817:

P. leachi; POISSON 1957: 125 - 126; *P. atomaria;* HEISS 1969: 18; *P. minutissima;* KERZHNER 1977: 357 - 359; TAMANINI 1979: 61.
N7907, 1 ♀.

Notonectidae LEACH 1815:

Notonecta glauca LINNÉ, 1758:

N. glauca; POISSON 1957: 133 - 135; HEISS 1969: 18; TAMANINI 1979: 58.
N7906c 1 lvV, 1 lvIV; N7914a 1 ♂ hard, overwintered, 2 lvII; N7914b 11 lvV, 5 lvIV; N7914c 1 ♂ soft, 1♂, 1 ♀ ± soft, 5 ♂ ± hard, 1 ♀ ± hard, LW, eggs–, 1 ♂ ± soft LW, 6 lvV, 4 lvIV.

Notonecta lutea MÜLLER, 1776:

N. lutea; HEISS 1969: 18; HEISS 1970: 68 - 77.
N7910 5 lvI/III; N7910a 4 ♂, 12 ♀ ± soft, ooc+, 3 lvV; N7910b 9 ♂, 8 ♀ eggs++, all (±) hard & SW; N7910c 4 ♂, 5 ♀ eggs++, (±) hard, SW; N7911a 1 ♂, 1 lvV; N7911b 3 ♀ ± hard, eggs++, SW; N7911c 1 ♂, 1 ♀ hard, eggs++, SW; N7912a 1 ♂, 1 ♀ ooc+, ± soft, 2 lvV, N7912b 2 ♂, 1 ♀ eggs++, SW; N7912c 1 ♀ eggs++, SW.

The SW condition in *N. lutea* is caused by the indirect wing muscles not developing. At their place there is a mass of soft spongy tissue. The catches of these two *Notonecta* species illustrate the difference in life history between those species overwintering in the egg stage (*N. lutea, N. reuteri*) and those which overwinter as adults (other *Notonecta*). In both cases there is only one generation/year.

Nepidae LATREILLE:

Ranatra linearis (LINNÉ), 1758:

R. linearis; POISSON 1957: 163 - 164; HEISS 1969: 20; TAMANINI 1979: 49.
N7903c 1 lvII; N7904a 1 lvIII; N7904c, 1 lvIV, 1 lvII; N7905a 1 lvII; N7905b 1 lvIII.

Naucoridae FALLÉN:

Ilyocoris cimicoides (LINNE), 1758:

Naucoris cimicoides; POISSON 1957: 152 - 153; TAMANINI 1979: 50; *I. cimicoides;* HEISS 1969: 19.
N7903a 5 lvI/III; N7903c 1 lvV, 3 lvI/III; N7910 1 adult (sighted).

Mesoveliidae DOUGLAS & SCOTT:

Mesovelia furcata MULSANT & REY, 1852, new for North Tyrol.

M. furcata; POISSON 1957: 166 - 167; TAMANINI 1979: 24.
N7903a 1 ♂, 2 lvV; N7903c 1 lvIV; N9707b 6 ♂, 3 ♀, 2 lvV, 2 lvIV, 2 lvI/III; N9707c 2 ♂, 2 ♀; N9710c 1 ♂; all apt.

Hydrometridae BILLBERG:

Hydrometra gracilenta HORVATH, 1899:

H. gracilenta; POISSON 1957: 174 - 175; HEISS 1969: 25; TAMANINI 1979: 26.
N9710 1 ♂ micr. A micropterous ♀ with eggs of this rare species was also collected on 21.VI.1978 at the Berglsteinersee (site N7902).

Veliidae AMYOT & SERVILLE:

Microvelia reticulata (BURMEISTER), 1835:

M. reticulata; POISSON 1957: 191 - 193; TAMANINI 1979: 28; *M. schneideri;* HEISS 1969: 23 - 24.

N7903a 5 ♂, 1 ♀ hard, eggs++, 1 lvV, 1 lvIV, 2 lvI/III; N7903b 1 lvIV; N7903c 1 ♀ ± hard, eggs–; N7910 1 ♂, 1 ♀ ooc++; N7910b 2 ♂, 4 ♀ ± hard, eggs++, 1 lvV; N7910c 1 ♀ ± hard, eggs–, 1 lvIV; N7913 1 ♂, 1 ♀ eggs–; N7913a 1 ♂ soft, 1 ♀ apt, ± soft, eggs++, 1 lvV, 1 lvIV; N7915 5 ♂, 7 ♀ hard, eggs++; N7915a 3 ♂, 6 ♀ hard, eggs++, 19 lvV, 10 lvIV, 3 lvI/III; all apt.; N7915b 9 ♂, 10 ♀ apt, ± hard, eggs–, 5 lvV, 2 lvIV, 1 ♂ macr; N7915c 36 ♂, 25 ♀ apt, ± hard, eggs–, 4 lvV, 1 lvIV, 1 lvI/III, 2 ♀ macr, ± hard, eggs–.

In all sites the adults collected on the first and second visit had overwintered. On the third visit (b-series) imagines of the new series have been found. These suggest at least a partial second generation in site N7910 but no second generation at site N7915. If this difference really exists, it is quite puzzling as apparently the development of the first generation in both populations is synchronous. Other data on *Microvelia* are scarce, LEBRUN (1960) gives them for larval development under laboratory conditions but does not mention number of generations in the field.

Gerridae LEACH:

Geriis rufoscutellatus LATREILLE, 1807:

G. rufoscutellatus; POISSON 1957: 218 - 219; HEISS 1969: 20; TAMANINI 1979: 38.

N7915a 2 lvIV/III; N7915b 2 ♂ soft, LW, 1 ♂ hard, SW, 1 ♀ ± soft, ooc–, LW, 9 lvV, 1 lvI/III, all macr.

At the last visit it was not found although especially looked for. The data suggest one generation a year and moreover that this species left this habitat quite early.

Gerris paludum FABRICIUS, 1794:

G. paludum; POISSON 1957: 220 - 221; HEISS 1969: 20; TAMANINI 1979: 38.

N7902A 2 ♂, SW; N7902Aa, 3 lvV, 4 lvIV; N7902Ab 1 ♂, 1 ♀, ooc+, all brach, ± soft, 5 lvV, 1 lvI/III; N7902Ac 1 ♂ macr, ± hard, LW, 2 ♂ macr, soft, 1 ♀ ± soft, ooc–, LW, 3 lvV, 2 lvIV, 4 lvI/III; N7903 5 ♂, 1 ♀ eggs++, all macr, hard, SW; N7903a 1 ♂, 1 ♀ eggs++, both macr, hard, SW, 1 lvV, 1 lvI/III; N7903b 2 ♂ macr, ± hard, 1 ♀ brach, ± hard, eggs++, 1 ♀ macr, ± soft, LW, 1 lvV; N7903c 1 lvV, 16 lvIV, 21 lvI/III; N7904a 3 lvV, 2 lvIV, 1 lvI/III; N7904b 1 ♂ brach, soft, 1 ♂ macr, ± soft, LW, 4 ♀ brach, ± soft, eggs++; N7904c 1 ♂ brach, 1 ♀ brach, eggs++, 1 ♂ macr, LW, 1 ♀ macr, ooc±, LW, 1 ♀ macr, ooc–, LW, all ± hard, 5 lvV, 5 lvIV, 8 lvI/III; N7905 2 ♀ macr, hard, eggs++, SW; N7905a 3 ♂, 4 ♀ eggs++, all macr, hard, SW, 1 ♀ brach, ± soft, eggs++, 3 lvV, 5 lvIV; N7905b 1 ♂, 3 ♀ eggs++, all brach, hard, 1 ♀ macr, ± soft, ooc–, LW, 13 lvIV, 10 lvI/III; N7905c 2 ♂ macr, soft, 6 ♂ macr, ± soft– ± hard, LW, 3 ♀ macr, ± soft– ± hard, ooc–, LW, 6 lvV, 1 lvIV, 11 lvI/III; N7913a 2 ♂, 1 ♀ eggs++, all macr, hard, SW, 12 lvV, 19 lvIV, 28 lvI/III; N7913b, 1 ♂ macr, hard, SW (overwintered), 1 ♂ macr, ± hard, LW, 1 ♂, 2 ♀ eggs++, all brach, hard, 5 ♀ macr, ± soft– ± hard, ooc–, LW, 11 lvV, 3 lvIV; N7913c 1 ♂ brach±, hard, 9 ♂ macr, ± hard, LW, 2 ♀ macr, ± hard, ooc–, LW, 1 lvV, lvIV, 3 lvI/III.

It is now known that the dominance of the brachypterous or macropterous form is not determined by characteristics of the habitat, as was believed by HEISS (1969). BRINKHURST (1959) confirmed the data of MITIS (1937) that there is, a rather short living, brachypterous summer generation and an overwintering macropterous generation in England and Germany. VEPSÄLÄINEN (1974a) found that this pattern occurs probably in Hungarian populations too, but VEPSÄLÄINEN (1974b) observed that the summer generation is aborted in Finland. As *G. paludum* seems to be restricted, in its reproducing populations, to altitudes up to 700 m in N.Tyrol (HEISS, 1969), such populations with supressed summer generations are not to be expected here. Fig. 1 illustrates the life cycle of *G. paludum* based on the ♀♀ taken during the present study. The macropters taken in autumn have developing or developed indirect wing muscles and show imaginal

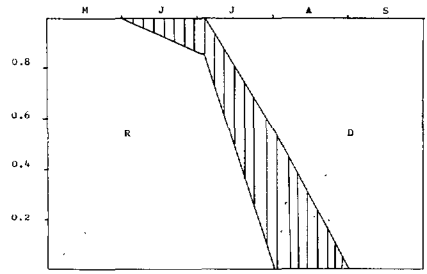

Fig. 1: Life cycle diagram of *Gerris paludum:* Vertical shading, brachypterous reproducing summer generation; right hand part marked D, diapausing macropterous LW specimens ready to overwinter; left hand part marked R, reproducing macropterous SW specimens which did overwinter. Horizontally the period May - September, vertically, fraction of population.

diapause (recognizable by strong development of adipose tissue and no oocyte development). The spring and early summer macropters have reduced indirect flight muscles and fully developed eggs. The brachypterous generation can only be found during a short period.

Gerris asper FIEBER, 1861:

G. asper; WAGNER & ZIMMERMANN 1955: 181-184; HEISS 1969: 21; TAMANINI 1979: 40. N7915 1 ♂ apt, hard, 2 ♀ apt, hard, eggs++; N7915a 4 lvV, 1 lvIV; N7915b 11 ♂ apt, hard, 1 ♂ micr, hard, 3 ♀ apt, ± hard, ooc–, 1 ♀ apt, ± soft, ooc–, 1 ♀ micr, ± soft, ooc–, 4 lvV, N7915c 1 ♂ apt, hard, 1 ♀ apt, hard, ooc–.

The data suggest one generation a year, which may be correlated with the fact that the species is found here near the northern border of its distribution. VEPSÄLÄINEN (1974a) assumes two generations in Hungary.

Gerris gibbifer SCHUMMEL, 1832:

G. gibbifer; POISSON 1957: 235-237; HEISS 1969: 22-23; TAMANINI 1979: 42. N7914b 1 ♀ macr, hard, eggs++, LW; N7914c 1 ♂ macr, soft, LW, 1 ♀ macr, soft, ooc–, LW.

These *G. gibbifer* are atypical in having the mesopleural tubercle yellowish. The soft specimens on N7914c may be considered proof that this species actually reproduces on this pond.

Gerris costai (HERRICH-SCHÄFFER), 1853:

G. costae; POISSON 1957: 231-233; *G. costai;* WAGNER & ZIMMERMANN 1955: 184-188; TAMANINI 1979: 40-42; *G. costai costai;* HEISS 1969: 22.
N7906 1 ♂ hard, LW; N9706a 1 ♂, 1 ♀ hard (put back on habitat); N9706b 2 ♂ hard, SW, 1 ♂ ± soft, LW, 2 ♀ hard, eggs++, SW, 1 lvV, 2 lvIV; N9706c 1 ♂ hard, LW, 1 lvV; N9707 1 ♀ hard, eggs++, LW; N7914 1 ♂ hard, LW, 2 ♀ hard, eggs++, SW; SN7914a 4 ♂ hard, LW; N7914b 1 ♂ ± soft, LW, 1 ♀ hard, eggs++, SW, 1 ♀ ± soft, ooc–, (SW), 1 ♀ ± hard, ooc–, LW, 3 lvV, 1 lvI/III; N7914c 1 ♂ soft, 8 ♂ ± hard, LW; 2 ♀ hard, ooc+, LW, 1 ♀ ± soft, ooc–, LW, 2 ♀ hard, ooc–, LW, 15 lvV, 5 lvIV, 2 lvI/III; N7917b 1 ♂ ± hard, LW, 1 ♀ hard, eggs++ (put back on habitat); all macropterous.

There seems to be one monomorphic macropterous generation each year, which agrees with the results of MITIS (1937) and BRINKHURST (1957). A brachypterous form exists but is very rare (JORDAN, 1947, cited in VEPSÄLÄINEN, 1974a). Reproduing populations have been found at altitudes from about 1000 m to about 1300 m. A ♀ with eggs was found at N7917b (2000 m) but on the subsequent visit no larvae or adults of *Gerris* have been found here. It is improbable that reproduction took place at about 2000 m in the 1979 season because of late spring and early cold.

Although morphologically monomorphic, this species seems to be physiologically dimorphic due to a part of the specimens showing no degeneration of the indirect flight muscles during the reproductive period. This may be connected with occasional breeding at higher altitudes. It would be worth while to figure this out in a warmer year.

Gerris lacustris (LINNÉ), 1758:

G. lacustris; POISSON *1957:* 242-244; HEISS *1969:* 23; TAMANINI *1979:* 42-44.

N7902 4 ♂, 2 ♀ macr, hard, eggs++, SW, many lvI between the reeds; N7902a 5 lvV 5 lvIV, 9 lvI/III; N7902b 1 ♂ macr, hard, LW, 1 ♂ macr, ± soft; 1 ♀ macr, soft, ooc–, LW, 1 ♀ macr, hard, eggs++, SW; 1 ♀ brach, hard, eggs++, 22 lvV, 10 lvIV, 8 lvI/III; N 7902c 1 ♂ macr, ± soft, 3 ♀ macr, ± soft– + hard, ooc–, LW, 5 lvV; N7902A 2 ♂ macr, hard, SW; N7902Aa 2 ♂ macr, SW, 2 lvIV, 29 lvI/III; N7902Ac 3 ♂ macr, soft, 4 ♂ macr, ± soft-hard, LW, 1 ♀ macr, soft, ooc–, 8 ♀ macr, ± soft– ± hard, ooc–, LW, 7 lvV, 1 lvIV, 1 lvI/III; N7903 1 ♂ macr, hard, 1 ♀ macr, hard, eggs++, SW; N7903a 2 lvV, 1 lvIV, 2 lvI/III; N7903b 4 ♂ macr, ± soft– ± hard, LW, 1 ♀ brach, ± hard, eggs++, 2 ♀ macr, ± soft– ± hard, ooc–, LW, 3 lvV, 1 lvIV, 6 lvI/III; N7904a 1 ♂ macr, SW, 1 ♀ macr, hard, eggs++, SW, 1 lvV, 3 lvIV; N7904c 1 ♂ soft, 1 ♂ ± soft, 1 ♀ ± soft, ooc–, LW, all macr, 1 lvV; N7905 1 ♂ SW, 1 ♀, eggs++, LW, 1 ♀ eggs++, SW, all macr, hard; N7905a 2 ♀ macr, hard, eggs++, SW; N7905b 1 ♂ macr, hard, SW, 2 ♀ brach, ±hard, eggs++, 1 ♀ macr, ± soft, ooc–, LW; N7905c 4 ♂ ± soft– ± hard, LW, 2 ♀ soft, ooc–, 3 ♀ ± soft– ± hard, ooc–, LW, all macr, 1 ♀ brach, soft, ooc–, 5 lvV, 2 lvIV, 27 lvI/III; N7906c 1 ♀ macr, ± hard, ooc–, LW; N7907 1 ♀ macr, hard, eggs++, SW; N7907a 1 ♀ macr, hard, eggs++, SW; N7907b 6 lvV, 3 lvIV, 3 lvI/III; N7907c 6 ♂ macr, ± soft– ± hard, LW, 27 ♀ macr, soft– ± hard, ooc–, LW, 31 lvV; N7908 1 ♂ (LW), 1 ♂ SW, 1 ♀ hard, eggs++, (LW), 3 ♀ (not killed) all macr; N7908a 1 ♀, macr, hard, eggs++, SW, many lvI/II between *Carex;* N7908c 1 ♂ soft, 1 ♂ ± soft, LW, 1 ♂ soft, ooc–, LW, all macr, 43 lvV, 3 lvIV; N7910 1 ♂ brach, hard, 1 ♀ macr, hard, eggs++, SW, 1 ♀ macr (not killed); N7910a 1 ♂ macr, hard, SW, 8 lvV, 3 lvIV, 3 lvI/III; N7911 1 ♂, 1 ♀ copula; N7911a a few larvae I/III; N7911b 1 ♀ brach, ± hard, eggs++, 2 ♀ macr, ± soft-hard, ooc–, LW; N7911c 1 ♀ macr, ± soft, ooc–, LW, 2 lvV; N7912 1 ♀ macr, hard, eggs++, SW; N7912a 1 ♀ macr, hard, eggs++, SW; 1 ♀ brach, soft, ooc–; N7913 3 ♂ macr, hard, SW, 3 ♀ macr, hard, eggs++, SW; N7913a 1 ♂ macr, hard, 2 ♀ macr, hard, eggs–, SW, 4 ♂ brach, hard, 2 ♂ brach, ± soft, 3 ♀ brach, soft, ooc+, 5 ♀ brach, ± soft, eggs++, 1 ♂ macr, ± soft, 50 lvV, 23 lvIV, 21 lvI/III; N7913b 7 ♂ ± soft– ± hard, LW, 2 ♀ soft, ooc–, 10 ♀ ± soft– ± hard, ooc–, LW, all macr, 1 ♀ brach, ± soft, ooc–, 1 ♀ brach, ± hard, eggs++, 12 lvV, 3 lvIV, 8 lvI/III; N7913c 14 ♂ macr, ± soft– ± hard, LW, 2 ♀ brach, ± hard, eggs++, 4 ♀ brach, ± hard, ooc–, 10 ♀ macr, ± soft, ooc–, LW, 24 lvV, 12 lvIV; N7914 1 ♀ macr, hard, eggs++, SW; N7915a 6 lvIV; N7915b 3 ♂ soft, 12 ♂ ± soft– ± hard, LW, 3 ♂ hard, SW, 5 ♀ soft, all macr, 1 ♀ brach, ± soft, eggs++, 1 ♀ macr, hard, eggs++, SW, 7 ♀ macr, ± soft– ± hard, ooc–, LW, 72 lvV, 21 lvIV, 14 lvI/III; N7915c 1 ♂ macr, hard, SW, 4 ♂ macr, soft, 15 ♂ macr, ± soft– ± hard, LW, 1 ♂ brach, soft, 1 ♀ brach, hard, eggs++, 6 ♀ macr, soft, ooc–, 6 ♀ macr, ± soft– ± hard, ooc–, LW, 1 ♀ macr, ± soft, ooc+(?), LW, 1 ♀ macr, ± hard, ooc+(?), LW, 52 lvV, 9 lvIV, 8 lvI/III.

The Tyrolian population at low altitudes seem to have an uniform brachypterous summergeneration. The two macropterous females with eggs from the b-series (30.VI. - 2.VII.) with eggs were clearly old, overwintered specimens. The total number of females in the b-series is 40. So it is possible that there is a small number of reproducing summer macropters, of which none have been taken. The fraction of summer macropters in this species is known to be quite variable with region. It is low in Denmark (ANDERSEN, 1973) and parts of Finland, but fairly high (over 0.2) in the extreme South of Finland (VEPSÄLÄINEN, 1974a), Poland (VEPSÄLÄINEN & KRAJEWSKI, 1974) and the Netherlands (VEPSÄLÄINEN & NIESER, 1977) and very high in Hungary (VEPSÄLÄINEN, 1974b). Low incidence of summer macropters is, according to VEPSÄLÄINEN (1974a), correlated with stability of the habitat. The populations in which females were taken in the b-series lived all on very stable habitats with the possible exception of N7915b.

In this species we find some evidence that differences in voltinism may occur between populations at different altitudes. At N7907 (1300 m) only larvae were taken on 2.VIII. and on 27.VIII. 27 females which were all diapause macropters. At N7908 there were, in spite of intensive searching, no *Gerris* on 2.VIII. On 27.VIII. there were taken three fresh soft– ± soft adults and 43 lvV. The data suggest that populations of *G. lacustris* at low altitudes (500 - 700 m) have two generations/year and populations at medium altitudes (1200 - 1300 m) have only one generation/year. One must bear in mind, however, that the 1979 season was rather cold. Univoltine populations of *G. lacustris* have been found in N.Finland (VEPSÄLÄINEN, 1974a) and in Lunz (DARNHOFER-DEMAR, 1973).

Gerris argentatus SCHUMMEL, 1832:

G. argentatus; POISSON 1957: 238; HEISS 1969: 23; TAMANINI 1979: 44.

N7902 1 ♂ macr, LW; N7902c 2 lvIV; N7903 1 ♀ macr, eggs++, SW; N7903a 6 ♂, 4 ♀ eggs++, all micr, ± hard, 8 lvV, 5 lvIV, 2 lvI/III; N 7903b 3 ♂ hard, 2 ♀ ± soft, eggs++, 1 ♀ ± hard, eggs++, all micr, 1 ♂ macr, hard, LW, 1 ♀ macr, ± soft, ooc–, LW, 21 lvI/III; N7903c 1 ♂ ± hard, LW, 1 ♀ ± soft, ooc–, LW, 2 ♀ ± hard, ooc–, LW, all macr, 6 lvV, 7 lvIV; N7904 1 ♀ macr, hard, eggs++, SW; N7905 4 ♂ SW, 2 ♀ eggs++, SW, all macr, hard; N7905a 5 ♂, 2 ♀ soft, ooc+, 7 ♀ ± soft, eggs++, all micr, 1 ♀ macr, hard, eggs++, SW, 2 lvV, 3 lvIV, 3 lvI/III; N7905b 2 ♂ ± soft, 4 ♂ hard, 2 ♀ ± soft, eggs++, 4 ♀ ± hard, eggs++, 5 ♀ hard, eggs++, all micr, 2 ♂ macr, ± hard, LW, 1 ♂ macr, soft, LW, 1 lvV; N7905c 2 ♂ ± hard, LW, 1 ♀ ± soft, ooc–, LW, 1 ♀ ± hard, ooc–, LW, all macr, 2 ♀ micr, hard, 2 ♀ micr, ± hard, eggs++, 8 lvV, 4 lvIV, 12 lvI/III; N7910b 1 ♂ macr, hard.

This species is quite common at a level of 500 - 700 m, where it has two generations a year. It is dimorphic, with the same type of life cycle as *G. paludum* with the difference that in *G. argentatus* the summer generation is micropterous. It may be apterous locally (e.g. VEPSÄLÄINEN & NIESER, 1977, Netherlands). The difference between apterous and micropterous in this species is more or less a matter of definition. According to HEISS (1969) the species occurs near Seefeld at levels up to 1200 - 1300 m and there apterous specimens of the summer generation have been found: Mösersee, 9.X.1960 (PECHLANER, quoted by HEISS, 1969), which is, in view of the date very dubious and needs confirmation.

Gerris odontogaster (ZETTERSTEDT), 1828:

G. odontogaster; POISSON 1957: 241 - 242; HEISS 1969: 23.

N7904c 1 ♂ macr, ± hard, LW, 1 lvI/III; N7906c 1 lvV; N7907 3 ♂ hard, LW, 1 ♂ hard, SW, 6 ♀ hard, eggs++, SW; N7907a 5 ♂ hard, SW, 2 ♀ hard, eggs++, SW; N7907b 1 ♂ ± soft, LW, 5 lvV; N7907c 1 ♀ ± soft, ooc–, LW; N7911a 1 lvV; N7911c 1 ♂ hard, LW; N7914b 4 ♂ ± hard, LW; N7917b 1 ♂ hard, LW, all adults macropterous.

Populations of this species are usually bivoltine dimorphic with a macropterous overwintering and a micropterous summer generation (VEPSÄLÄINEN, 1974a). In N.Finland the populations are univoltine macropterous (VEPSÄLÄINEN l.c.). According to HEISS (1969) *G. odontogaster* is commoner in lower regions (500 - 700 m) than my data suggsts. The population on Wildmoosalm seems to be univoltine macropterous. Populations with micropters are known from N.Tyrol (HEISS, 1969). So this species might have bivoltine and univoltine populations as a function of altitude within the region.

The data suggests the following preliminary conclusion. The reproducing populations of most *Gerris* species, *G. rufoscutellatus*, *G. paludum*, *G. asper*, *G. costai* and *G. gibbifer*, are restricted to a rather narrow range of altitudes in N.Tyrol. These have only one type of life cycle within the region.

Two species, *G. lacustris* and *G. odontogaster* have reproducing populations at a wider range of altitudes and show bivoltine life cycles at low and univoltine life cycles at higher altitudes. *G. lacustris*, which is usually polymorhic throughout the year, seems to have a nearly monomorphic brachypterous summer population in the lower parts of N.Tyrol. Moreover the number of overwintering brachypters seems to be very low. *G. odontogaster* is bivoltine dimorphic, with a micropterous summer generation, in lower parts and univoltine, macropterous at Wildmoosalm (1300 m).

The data on *G. argentatus*, finally, is inconclusive.

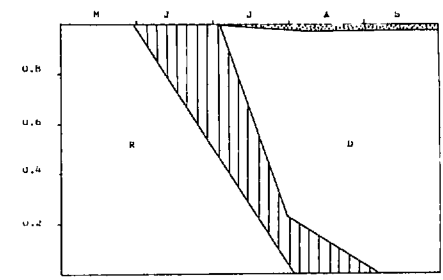

Fig. 2: Life cycle diagram of *Gerris lacustris:* Explanation as in fig. 1; punctated area, diapausing brachypterous specimens ready to overwinter.

S u m m a r y : Records of aquatic and semiaquatic Heteroptera taken in Northern Tyrol during four visits of 16 localities in the 1979 season. For most species the following parameters have been recorded: wingdevelopment, condition of indirect flight muscles, presence or absence of eggs or developing oocytes and the hardness of the chitin.

New species for N.Tyrol are *Mesovelia furcata* (MLS & REY), *Micronecta griseola* HORV. and *Sigara longipalis* (SAHLB.).

All specimens of *Notonecta lutea* MÜLL. studied had degenerate indirect flight muscles. In Gerridae it is noted that in most species reproducing populations are more restricted with regard to altitude than the known distributional records suggest. Two species, *Gerris lacustris* (L.) and *G. odontogaster* (ZETT.) have a comparatively wide range of reproducing populations. In these species bivoltine populations have been found at lower and univoltine populations at higher altitudes.

References:

ANDERSEN, N.M. (1973): Seasonal polymorphism and developmental changes in organs of flight and reproduction in bivoltine pondskaters (Hem. Gerridae). – Ent. Scand., **4**: 1 - 20.

BRINKHURST, R.O. (1959): Alary polymorhism in the Gerroidea. – J. Anim. Ecol., **28**: 211 - 230.

DARNHOFER-DEMAR, B. (1973): Zur Populationsdynamik einer univoltinen Population von *Gerris lacustris* (L.) (Heteroptera, Gerridae). – Zool. Anz., **190**: 189 - 204.

HEISS, E. (1969): Zur Heteropteren Fauna Nordtirols I. Wasserwanzen (Corixidae - Hydrometridae). – Alpin.-biol. Stud. (Univ. Innsbruck), **3**: 1 - 28, 1 map.

HEISS, E. (1970): *Notonecta reuteri* HUNGERFORD 1928, neu für den Alpenraum. – Nachrbl. bayer. Ent., **18**: 68 - 77.

KERZHNER, I.M. (1977): O nauchnom nazvanii obychnogo palearkticheskogo vida klopov roda Plea Leach (Heteroptera, Pleidae). – Ent. Obozr., **56**: 357 - 359.

LEBRUN, D. (1960): Recherches sur la biologie et l' éthologie de quelques Hétéroptères aquatiques. - Ann. Soc. ent. France, **129**: 179 - 199.

MITIS, H. von (1937): Ökologie und Larvenentwicklung der mitteleuropäischen *Gerris* Arten (Het.). – Zool. Jb., **69**: 337 - 372.

POISSON, R.A. (1957): Hétéroptères aquatiques. – Faune de France, **61**: 263 pp.

TAMANINI, L. (1979): Eterotteri Acquatici (Heteroptera: Gerromorpha, Nepomorpha). – Guide per il riconoscimento delle specie animale delle acque interne italiane, **6**: 106 pp.

VEPSÄLÄINEN, K. (1974a): The life cycles and wing lengths of finnish *Gerris* F. species (Heteroptera, Gerridae). –

VEPSÄLÄINEN, K. (1974b): The wing lenghts, reproductive stages and habitats of Hungarian *Gerris* F. species (Heteroptera, Gerridae). – Ann. Ac. Sc. Fenn. (A) IV Biol., **202**: 18 pp.

VEPSÄLÄINEN, K. & KRAJEWSKI, S. (1974): The life cycle and alary dimorphism of *Gerris lacustris* (L.) (Heteroptera, Gerridae) in Poland. – Not. Ent., **54**: 85 - 89.

VEPSÄLÄINEN, K. & NIESER, N. (1977): Life cycles and alary morphs of some Dutch *Gerris* species (Heteroptera, Gerridae). – Tijdschr. Ent., **120**: 199 - 212.

WAGNER, E. & ZIMMERMANN, S. (1955): Beitrag zur Systematik der Gatting *Gerris* F. (Hemiptera - Heteroptera, Gerridae). – Zool. Anz., **155**: 177 - 190.

WROBLEWSKI, A. (1958): The Polish species of the genus *Micronecta* Kirk. (Heteroptera, Corixidae). – Ann. Zool. Pol., **17**: 247 - 381.

YOUNG, E.C. (1965a): Teneral development in British Corixidae. – Proc. R. ent. Soc. London A, **40**: 159 - 167.

YOUNG, E.C. (1965b): The incidence of flight polymorphism in British Corixidae and description of the morphs. – J. Zool., **146**: 567 - 576.

YOUNG, E.C. (1965c): Flight muscle polymorphism in british Corixidae: ecological observations. – J. Anim. Ecol., **34**: 353 - 390.