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Weitere Untersuchungen zur Gattung *Meotica* Mulsant et Rey (Col., Staphylinidae)

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Abstract: BENICK, G. 1968. Weitere Untersuchungen zur Gattung *Meotica* Mulsant et Rey (Col., Staphylinidae). *Norsk ent. Tidsskr.* **15,** 83-89. .

Verfasser erklärt nach Typenuntersuchung, dass die von den englischen und nordischen Autoren, sowie von Prof. Dr. Scheerpeltz als *Meotica exilis* bezeichnete Art tatsächlich die von ihm 1953 beschriebene *M. apicalis* ist; *M. exiliformis* Joy ist artgleich mit der echten *M. exilis* Er. *M. angulata* Bck. ist gute Art. Dagegen ist *M. clavata* Bck. artgleich mit *M. apicalis* Bck. Anstelle der vernichteten Type von *M. soniae* Bondr. bestimmt Verfasser eine Lectotype und gibt genaue Beschreibung und Bestimmungstabelle. *M. strandi* Scheer. ist artgleich mit *M. lohsei* Bck. Eine neue Art, *M. koch* Bck., wird beschrieben und in Bestimmungstabelle eingereiht.

Nach dem Erscheinen meiner Arbeit über die Gattung *Meotica* Mulsant et Rey (Benick 1953), und nachdem Scheerpeltz (1954 a) eine Bestimmungstabelle der palaearktischen Arten dieser Gattung veröffentlich hatte, setzte sich Strand (1955) mit meiner Auffassung einiger Arten auseinander. Die erforderliche Beschaffung von Typen, die Schwierigkeit der klaren Erkennung der Objekte, vor allem aber Zeitmangel haben mich bisher daran gehindert, zu seinen Ausführungen Stellung zu nehmen. Gelegentlich meiner Mitarbeit an dem Werk »Die Käfer Mitteleuropas« wird es jetzt unumgänglich, die angeschnittenen Fragen einer Klärung zuzuführen. Das soll im folgenden geschehen:

WAS IST *MEOTICA EXILIS* ER.?

Als ich meine oben zitierte Arbeit schrieb, war ich der Meinung, dass über den Begriff der Art *exilis ER.* irgendwelche Zweifel nicht bestünden und bestehen könnten. Ich habe die Art trotzdem genau beschrieben, da viele der weiteren z. T. neu beschriebenen Arten mit ihr verglichen wurden. Aus der Arbeit von Scheerpeltz (1954a) wurde mir klar, dass er die Art *exilis Er.* offenbar anders auffasst als ich. Auf diese Tatsache weist Strand (1955) hin. Aus seinen Ausführungen ist mir klar geworden, dass die nordischen und mindestens z. T. auch die britischen Coleopterologen die Art, die ich als *apicalis* neu beschrieben habe, als die Art *exilis* Er. angesprochen haben und bis heute ansprechen.

Ich habe mir also die Typen von *exilis* Er. aus dem Berliner Zoolog. Museum beschafft. Sie liegen mir vor. Es sind 6 Stücke, die die Nr. 5450 tragen. Das letzte dieser Stücke entfällt offensichtlich für unsere Untersuchungen. Es weicht von den übrigen Stücken entscheidend ab. Ich halte es für eine *wagneri* Bck., die ich in meiner obigen Arbeit neu beschrieben habe. Die übrigen fünf Stücke gehören offenbar zu der gleichen Art. Leider fehlen bei zwei von ihnen die Vorderkörper. Ich habe die beschädigten Exemplare, weil mir das unbedenklich schien, genital untersucht. Bei einem Stück missglückte die Untersuchung, beim anderen Stück, ♀, ergab sich eindeutig das kleine, einfach gekrümmte Organ, wie es die Art besitzt, die ich in meiner oben zitierten Arbeit als *exilis* angesprochen habe. Strand (1955) bildet dieses Organ in seiner Arbeit auf dem Bild Nr. 9 ab und bezeichnet die Art als *exillima* Sh. von Shell Bay, England. Ich nahm an, dass hier eine Verwechslung der Bilder vorgekommen sei und habe Strand diese meine Meinung mitgeteilt. Er war so freundlich, mir die in Frage kommenden Tiere mit den Originalpräparaten der Abbildungen Nr. 8 und 9 seiner Arbeit zu übersenden. Dabei stellte sich folgendes überraschende Ergebnis heraus: Das Tier, dessen ♀ Organ unter Nr. 9 abgebildet ist, hat Strand von Harwood — England als *exillima* erhalten, wie der darunter befindliche Zettel zeigt, und hat es daher in der Abbildung Nr. 9 unter diesem Namen veröffentlicht. Tatsächlich handelt es sich aber um eine von der echten *exillima* Sh. deutlich unterschiedene Art, wie schon äusserlich der stärkere Glanz und die abweichende Kopf- und Fühlerbildung zeigen. Vor allem ist aber das ♀ Organ von demjenigen von *exillima* Sh. deutlich unterschieden. Dieses Organ von *exillima* Sh. ist unter den bei Strand (1955) gezeigten Abbildungen überhaupt nicht vorhanden. Ich vermutete zunächst, dass das Bild Nr. 8 bei Strand die Spermatheca von *exillima* darstelle. Mir liegt auch dieses Stück mit dem Originalpräparat von Svene, A. Strand vor. Das Organ hat die gleiche Form wie das unter Nr. 9 abgebildete, ist nur um ein geringes grösser. Es handelt sich auch hier eindeutig um die von mir als *exilis* Er. bezeichnete Art.

Unter dem mir von Strand übersandten Material befand sich auch ein englisches Tier von Bricketn d. 20. 3. 26, das als *exiliformis* seitens des englischen Sammlers bezeichnet war. Dabei handelte es sich nun umgekehrt um eine ganz klare *exillima* Sh. (matt, Kopf und Fühlerbildung).

Zusätzlich hat Strand noch 3 weitere richtig als *exillima* Sh. bezeichnete Stücke aus England.

Es zeigt sich also, dass Strand bei Abfassung seiner Arbeit unrichtig bestimmtes Material zu Grunde gelegt hat, dadurch unrichtig bezeichnete Bilder veröffentlicht hat und damit zu unrichtigen Ergebnissen kommen musste. Jedenfalls steht fest, dass das ♀ Genitalorgan der Erichsonschen Type nicht das Bild Nr. 7, das am Ende den deutlichen zusätzlichen Haken hat, zeigt. Das einzige ♂ unter den Erichsonschen Typen ist ohne Penisuntersuchung, die ich hier nicht wagen möchte, eindeutig zu erkennen: es zeigt genau die Auszeichnung des 6. Ventralsegments, wie ich sie in meiner obigen Arbeit beschrieben habe, nämlich die deutliche Verlängerung dieses Segments über das 8. Dorsalsegment in etwas verjüngtem Bogen. Demgegenüber hat das ♂ meiner *apicalis (exilis* sensu Strand — Scheerpeltz) ein mehr zurückgezogenes 6. Ventralsegment, das sehr deutlich in einem Winkel von etwa 150° zugespitzt ist — ein Unterschied, der so eindeutig ist, dass es einer Genitaluntersuchung des einzigen typischen ♂ der *exilis* nicht bedarf.

Übrigens zeigt auch die Beschreibung Kraatz' (1858), des Staphylinidensachbearbeiters in Erichsons »Naturgeschichte der Insekten Deutschlands«, dass es sich nur um diese Art handeln kann, wenn er sagt: »Geschlechtsunterschiede treten am Hinterleibe nicht hervor.« Ein so feiner Beobachter wie Erichson hätte sicher nicht übersehen, dass das 6. Ventralsegment des ♂ so deutlich winkelig zugespitzt ist, wenn er die von mir benannte *apicalis* hätte beschreiben wollen. Dass er die mehr oder weniger starke Abrundung des 6. Ventralsegments beim ♂ und ♀ nicht für einen Geschlechtsunterschied hielt, ist durchaus verständlich.

Auch seine Angabe bezüglich der Regelfarbe von *exilis* mit »schwarzbraun« spricht für meine Auffassung von *exilis*. Meine *apicalis* sind niemals schwarzbraun.

Schliesslich kommt noch hinzu, dass in Norddeutschland, woher die Typen stammen (Berlin) *exilis* in meinem Sinne die viel häufigere Art ist, während *apicalis* recht selten ist und meist nur einzeln gefunden wird. Die Serie der Typen von 5 Tieren gehört dementsprechend auch zu der von mir als *exilis* gedeuteten Art.

Es kann m. E. danach nicht mehr zweifelhaft sein, dass die von Strand (1955) und Scheerpeltz (1954) als *exilis* Er. angesprochene Art nicht diese Art ist, sondern zu der von mir in obiger Arbeit neu beschriebenen *apicalis* gehört.

WAS IST *M.EXILIFORMIS* JOY?

Was nun die *M. exiliformis* Joy anbelangt, so hatte ich mich, wie ich gestehen muss, im wesentlichen auf die eigene Erklärung beider Autoren Sharp (1915) und Joy (1915) unmittelbar nach der Beschreibung der beiden Arten *exillima* Sharp und *exiliformis* Joy verlassen, dass die Arten identisch seien und habe deshalb keine gründlichen Untersuchungen deswegen angestellt. Die spätere Veröffentlichung von Joy (1932), wo er die Meinung vertritt, die Art sei doch von *exillima* verschieden, kannte ich nicht.

Mir ist jetzt aber eindeutig klar geworden, dass *exiliformis* Joy artgleich mit der echten *exilis* Er. ist.

Ich habe oben nachgewiesen, dass die Auffassung der nordischen und britischen Coleopterologen über *M. exilis* falsch ist und dass es sich bei der von ihnen als *exilis* Er. bezeichneten Art um meine *apicalis* handelt. Auch Joy (1915) ist offensichtlich diesem Irrtum unterlegen, wie seine Bemerkung: »aedeagus at the apex rather strongly bifid« zeigt. Natürlich musste er dann das kleinere, schmälere, dunklere Tier mit etwas schmälerem Kopf und längeren Flügeldecken für eine neue gute Art halten.

Er sagt mit Recht nichts davon, dass *exiliformis* weniger glänzend als *exilis (= apicalis)* sei, oder dass der Halsschild weniger breit sei. Auf diese beiden Unterschiede weist aber Sharp (1915a) in seiner Beschreibung der *exillima* hin. Der Halsschild bei *exillima* ist fast nur so lang wie breit, wie er schreibt. Das wiederum zeigt aber deutlich, dass *exiliformis* eine andere Art als *exillima* ist, da bei ihr der Halsschild wie bei *apicalis,* also ⅓ breiter als lang ist.

Sharp (1915a) weist vor allem auch auf die völlig abweichende Lebensweise von *exillima* hin, die er nur in *Sphagnum* gefunden hat. *Exiliformis* hat Joy (1915) aber zahlreich in Flutrückständen gefunden — der typische Fundort, an dem man unsere *exilis* in Deutschland auch zahlreich findet.

Hansen schrieb mir derzeit mit Recht, dass der Hinterrand des 6. Ventralsegments bei *exiliformis* im Gegensatz zu *exillima* beim ♂ abgerundet, nicht winklig sei. Ihm lagen offenbar entsprechende Belege von *exiliformis* vor.

Ich war jetzt einige Tage in London und habe die mich interessierenden Arten aus den verschiedenen Sammlungen dank der gütigen Unterstützung von Mr. Pope, dem Leiter der entomologischen Abteilung, ansehen können. Dabei habe ich auch das umfangreiche Meotica-Material der Sharp'schen Sammlung angesehen. Sharp hatte auch eine Anzahl von »*exiliformis* Joy« in seiner Sammlung. Das eine dieser Stücke trug die von Sharp geschriebene Bezeichnung »Ind. typ. Joy« Die restlichen Stücke von *exiliformis* stimmten mit diesem Stück überein. Es waren sämtlich eindeutig *exilis* Er, so wie ich diese Art auffasse.

Sharp hatte ausserdem Stücke, die er in seiner Sammlung in Britischen Museum mit '*exilis* Joy' bezeichnet hatte und die nach einem weiteren Vermerk von Britten stammten. Sie hatten ♂ und ♀ Genitalpräparate, die eindeutig diejenigen von *apicalis* waren.

Ich glaube, dass damit eindeutig klargestellt ist, dass *exiliformis* Joy = *exilis* Er. ist.

M. ANGULATA BCK. NICHT SYNONYM VON *M. FINNMARCHICA* BCK.

In seiner Arbeit vertritt Strand (1955) die Aufassung, die von mir beschriebene *angulata* sei artgleich mit *finnmarchica* Bck. Ich muss dieser Meinung widersprechen.

Das einzige typische Stück von *angulata* zeigt genau in der Mitte des 8. Dorsalsegments eine auf beiden Seiten ganz gleichmässig geformte tiefe Einbuchtung. Ich habe das Stück genauestens mit meinem Leitz-Binocular untersucht und dabei am linken Innenrand der Ausrandung eine kurze schwarze Borste festgestellt, die bei einer künstlichen Verletzung unmöglich da sein könnte. Offenbar sind die anderen Borsten an der Ausrandung beschädigt und daher nicht erkennbar. Ich glaube jedenfalls nicht, dass es sich bei dieser Ausbuchtung um eine nachträgliche Verletzung handelt. Auch eine nochmalige Untersuchung meiner Type von *finnmarchica* bezüglich des 6. Ventralsegments zeigt die von mir angegebene flache breite Ausbuchtung, die bei *angulata* fehlt.

Ich halte es daher nicht für richtig, wenn Strand meint, dass angulata synonym zu *finnmarchica* Bck. sei.

M. CLAVATA BCK. = *M. APICALIS* BCK.

Strand (1955) hat degegen Recht, wenn er schreibt, er halte die von mir als neue Art beschriebene clavata für artgleich mit der Art, die er als *exilis* bezeichnet. Ich habe oben nachgewiesen, dass *exilis* sensu Strand = *apicalis* Bck. ist. Demnach ist *clavata* artgleich mit *apicalis*.

Mein Freund Kerstens hat auf meine Bitte die typischen Exemplare von *clavata* genital untersucht. Der Penis zeigt an der Spitze deutlich die Einbuchtung, die Spermatheca deutlich den kleinen zusätzlichen Haken am Ende, wie sie bei *apicalis* vorhanden sind. Man wird daher trotz der ungewöhnlich stark keulenartig verdickten Fühler, deren vorletzte Glieder 3 × oder mehr breiter als lang erscheinen, die Tiere zu *apicalis* stellen müssen.

WAS IST *MEOTICA SONIAE* BONDR.?

Ich freue mich, dass es mir jetzt möglich ist, die Angelegenheit um *Meotica soniae* Bondr. endgültig klären zu können.

Das einzige typische Stück ist mit der Sammlung Bondroit als vernichtet anzusprechen, wie mir Herr G. Fagel—Brüssel derzeit mitteilte. Es stammte aus dem Foret de Soignes in der Nähe von Woluwe (Brabant).

In meiner *Meotica*-Arbeit hatte ich mich weitgehend auf ein Exemplar gestützt, das Scheerpeltz mir als *soniae* bestimmt hatte, das aber beim Transport stark beschädigt war (Kopf und Halsschild verloren).

Inzwischen erhielt ich nun in einer Bestimmungssendung von Herrn G. Fagel—Brüssel mehrere von ihm in der Nähe des Originalfundortes gefundene *Meotica*, die ich zunächst für abweichende Stücke einer anderen bekannten Art angesehen hatte. Ein genauer Vergleich mit der eingehenden sehr guten Beschreibung Bondroits (1913) lässt aber jetzt keinen Zweifel mehr übrig, dass diese Tiere und ein weiteres Stück, das ich von Reutte, Tirol 26. 12. 32 Maulwurf leg. Pechlaner besitze, zu *soniae* Bondr. gehören.

Alle Tiere stimmen genauestens mit der Beschreibung überein. Besonders bezeichnend ist die Färbung der Tiere, von der Bondroit in seiner Beschreibung sagt: »Assez luisante, d'un brun roussâtre clair, tete et abdomen avant l'extremité faiblement rembrunis«. Tatsächlich handelt es sich um ein eigenartig glasig durchscheinendes Braunrot, das entscheidend von der Färbung fast aller sonstigen Meotica-Arten abweicht.

Ich gebe nachstehend noch einmal eine genaue Beschreibung der Art, zumal die Beschreibung Brondoits in den Annalen der belgischen naturw. Gesellschaft nicht ohne weiteres für jeden greifbar ist.

Meotica soniae Bondroit

Gross, kräftig, ziemlich breit.— Ziemlich glänzend. Satt rotbraun, besonders am Kopf etwas glasig durchscheinend, Kopf und vorletzte Hinterleibssegmente etwas dunkler, Fühlerbasis, Taster und Beine gelb, Fühler vom 5. Gliede an dunkler werdend. Keule dunkelbraun. Chagrin mit Lupenvergrösserung sicher erkennbar. Behaarung ziemlich dicht, anliegend, hellgrau, auf Kopf und Hinterleib besonders zur Spitze weitläufig.

Kopf stark gerundet nach hinten erweitert, im hinteren Drittel am breitesten, dort im Verhältnis 26 : 20 breiter als lang (von Halsverengung bis zur Fühlerbasis gemessen) fast so breit wie der Halsschild, Schläfen hinten breit abgerundet, Schläfen im Verhältnis 13 : 5 länger als die Augen, diese nahezu völlig in das Kopfniveau eingelassen. Ein äusserst feines Netzchagrin und eine sehr feine, ziemlich dichte Punktierung nur mit starker Binocularvergrösserung erkennbar. Mit sehr deutlicher Kopfmittelfurche, die ziemlich weit nach vorn verläuft und hinten schwächer wird.

Fühler kräftig, zurückgelegt den Hinterrand des Halsschildes erreichend. Glied 2 doppelt so lang wie breit, ein wenig kürzer und schmäler als das erste langovale Glied, Glied 3 gestielt, deutlich kürzer als 2, Glied 4 deutlich quer, etwa ½ breiter als lang, Glied 5—10 gleichlang, allmählich breiter werdend, vorletzte Glieder gut doppelt so breit wie lang, Glied 11 zugespitzt, so lang wie 9 + 10 zusammen.

Halsschild im Verhältnis 27 : 21 breiter als lang, im vorderen Viertel am breitesten, von dort nach vorn kurz, nach hinten geradlinig stark verengt, Hinterwinkel deutlich, an der Spitze abgerundet. Chagrin und Punktierung wie auf dem Kopf. Mit einem breiten hinten ziemlich tiefen bis zur Mitte reichenden Längseindruck vor der Basis. Behaarung in der Mittellinie nach hinten gerichtet.

Flügeldecken an der Naht so lang wie der Halsschild, nach hinten kaum erweitert, am Hinterrand im Verhältnis 26 : 24 breiter als an den Seiten lang, in den Aussenecken nicht ausgebuchtet. Behaarung ziemlich dicht anliegend, gerade nach hinten gerichtet. Punktierung etwas kräftiger als auf dem Halsschild, sehr dicht, mit Lupenvergrösserung erkennbar. Chagrin etwas deutlicher als auf dem Vorderkörper.

Hinterleib wenig nach hinten erweitert. Die drei ersten Segmente an der Basis quer eingedrückt. Punktierung fein, aber deutlich, mässig dicht, hinten wesentlich weitläufiger. Mit engem Netchagrin, das auf den vorderen Segmenten etwas grossmaschiger und mehr quergelagert, etwas kräftiger als hinten ist. 5. Segment etwa ⅓ länger als das 4.

Länge: 2 mm

♂ 8. Dorsalsegment stark verengt, schwach gerundet abgestutzt, 6. Ventralsegment in kurz gerundetem Bogen kaum darüber verlängert. ♀ 8. Dorsalsegment breit gerade abgestutzt. 6. Ventralsegment kaum darüber verlängert, verengt, vorn kurz schwach ausgebuchtet.

Durch die auffällige Färbung, die Grösse, die tiefe Kopffurche und die ziemlich langen Flügeldecken gut unterschieden.

Mit *foveolata* G. Bck. am nächsten verwandt. Von ihr durch abweichende dunklere Färbung, etwas breiteren nach hinten viel stärker verengten Halsschild und dichter und deutlicher punktierte Flügeldecken unterschieden.

Das stark beschädigte Exemplar von Lübeck, das mir Prof. Scheerpeltz derzeit als *soniae* bestimmte, gehört sicher nicht zu dieser Art. Seine Unterbringung muss bis zum Vorliegen weiteren Materials offen bleiben, da ohne Kopf und Halsschild etwas Sicheres nicht gesagt werden kann.

Fest steht, dass die von Scheerpeltz (1954a) in seine Tabelle als *soniae* aufgenommene Art sicher nicht diese Art ist. Die Fühler der dort beschriebenen Art sind fast 3 × so breit wie lang, fast scheibenförmig, die Halsschildhinterwinkel wenig deutlich, Flügeldecken um ¼ länger als der Halsschild. Über die auffällige Färbung wird gar nichts gesagt.

Mir liegen drei von G. Fagel in Brabant gesammelte Exemplare von Ben-Ahin, ruisseau de solières 13. 5. 48 u. 18. 4. 49 (letzteres bei einer kleinen schwarzen Ameise gefangen) und Seilles, rivage, 11,—19. 8. 45 sowie ein weiteres Exemplar von Reutte, Tirol 26. 12. 32 leg. Pechaner vor.

Ich habe im Hinblick auf die Zerstörung der Originaltype, das Stück von Ben-Ahin ruisseau de Solières 13. 5. 49, ein ♀, als Ersatztype bestimmt. Sie befindet sich mit dem Stück von Seilles in Sammlung Fagel, die beiden restlichen Stücke in meiner Sammlung.

Die Art ist sicher, wie die Fundorte zeigen, in Mitteleuropa weiter verbreitet, aber allgemein verkannt.

In meiner Tabelle (Benick 1953) ändert sich die Nr. 9 wie folgt:

9 Grösser, ca. 2,3 mm. Einfarbig, hellbraunrot, Kopf nur so breit wie lang, etwas weniger nach hinten erweitert. Augen etwas vorspringend. Halsschild ca. ⅓ breiter als lang. 5. Dorsalsegment um die Hälfte länger als das vierte .... *ermischi*

– Etwas kleiner, um 2 mm. Dunkler, sattrotbraun, etwas glasig durchscheinend, Kopf gut ⅕ breiter als lang, etwas mehr nach hinten erweitert. Augen völlig im Kopfumriss verschwindend, Halsschild gut ⅕ breiter als land. 5. Dorsalsegment etwa ⅓ länger als das vierte .... *soniae*

STRANDI SCHEERP. = *LOHSEI* BCK.

Herr Dr. Strand war so freundlich, mir kürzlich ein Exemplar der von Prof. Scheerpeltz 1958 beschriebenen *Meotica strandi* zur Verfügung zu stellen.

Meotica strandi Scheerp. ist ohne Zweifel artgleich mit Meotica *lohsei* G. Bck.

Schon ein Vergleich der Diagnosen ergibt das recht deutlich. Besonders bezeichnend für *Meotica* die fast parallelen Schläfen-konturen, die Scheerpeltz hervorhebt. Scheerpeltz misst die Schläfenlänge »von den Hinterrändern der Augen bis zu den Buchten, in denen die Konturen beginnen sich zum Halse zu verengen« und stellt dabei fest, dass die Schläfen nur so lang sind wie die Augen. Meine Messung der Schläfen erfolgte bis zur Randlinie der Schläfen. Dann ergibt sich ein Verhältnis von 5½ : 3½. Eine Nachprüfung an dem mir vorliegenden Exemplar von strandi zeigt genau das gleiche Verhältnis.

Auch die Zeichnung der Spermatheca von *strandi* stimmt genau mit dem herauspräparierten Organ von *lohsei* überein. Danach besteht für mich an der Artgleichheit kein Zweifel.

MEOTICA KOCHI G. BENICK NOV.SPEC.

Vor einiger Zeit erhielt ich von Herrn Claus Koch–Düsseldorf ein ♀ Exemplar einer *Meotica*, die ich von vornherein für eine neue Art hielt. Ich habe inzwischen mehrere weitere Exemplare meiner *foveolata* und auch weiteres Material meiner *lohsei* vorliegen, zwischen denen die neue Art systematisch steht, und bin jetzt sicher, dass es sich um eine neue Art handelt, die ich nachstehend beschreibe:

Meotica *kochi* G. Benick nov. spec.

Vorderkörper mit Flügeldecken sattbraun, Hinterleib gelbrot, Taster, Beine und 1. Fühlerglied gelb, restliche Fühler braungelb. Nur mässig glänzend. Behaarung ziemlich dicht und kurz, anliegend. Chagrin dicht, äusserst fein.

In der Form des Kopfes zwischen *lohsei* und *foveolata* stehend. Während bei *lohsei* der Kopf durch die stark vorspringenden grossen Augen eckig wirkt, treten die Augen bei *foveolata* nur wenig aus dem Kopfniveau hervor und sind viel kleiner, der Kopf ist schwach aber deutlich erweitert. Bei der neuen Art treten die Augen ebenso wenig wie bei *foveolata* aus dem Kopfniveau hervor, die fein gerandeten Schläfen sind im Verhältnis 6 : 2½ länger als die Augen, die Wangen sind hinter den Augen nahezu gleichmässig gerundet, so dass der Kopf fast völlig oval erscheint. In der Mitte hat der Kopf ein deutliches längliches Grübchen. Punktierung äusserst fein und dicht.

Die Länge der Augen stimmt etwa mit derjenigen bei *foveolata* überein, jedoch sind die Wangen bei *foveolata* mehr gerade und deutlich erweitert, weniger gerundet. Gegenüber *lohsei*, deren Schläfen im Verhältnis 5½ : 4 länger als die Augen sind, ist der Unterschied auch durch deren stark vorspringende Augen ausserordentlich auffällig.

Von beiden Arten unterscheidet sich die neue Art durch wesentlich kräftigere Fühler. Die 3 ersten Glieder stimmen in der Form etwa überein, Glied 4 ist jedoch auffällig dicker, nahezu doppelt so breit wie lang, Glied 5 und 6 wohl 2½ × und Glied 7–10 etwa 3× so breit wie lang, Glied 11 dick zugespitzt, etwas länger als 9 + 10 zusammen.

*Halsschild*breite etwa gleich, im Verhältnis 13 : 11 breiter als lang, im Verhältnis 13 : 11 breiter als der Kopf, in der Mitte der ganzen Länge nach abgeflacht. Behaarung in der Mittellinie von vorn nach hinten gerichtet. An den Seiten nur schwach verengt.

Flügeldecken an der Naht im Verhältnis 10 : 10 so lang wie der Halsschild, an den Seiten im Verh. 13 : 15 kürzer als an der Basis, leicht ausgeschweift, dicht und fein punktiert, ähnlich wie *lohsei.*

Abdomen an der Basis der drei ersten Segmente quer eigedrückt. Fein und weitläufig, auf dem 4. vereinzelt punktiert, auf dem 5. glatt.

Länge: 1,8 mm.

♀ 8. Dorsalsegment gerade abgestutzt. 6. Ventralsegment in weiten flachem Bogen etwas darüber verlängert.

Das einzige Exemplar fand Herr Claus Koch am 21. 3. 59 bei Düsseldorf. Er überliess es mir freundlichst für meine Sammlung.

Ich erlaube mir, die Art ihm zu Ehren zu benennen.

In meine *Meotica*-Tabelle (Benick 1954) ist die Art wie folgt einzufügen:

16 Stark glänzend. Flügeldecken weitläufig punktiert. 4. Fühlerglied etwa ⅓ breiter als lang .... *wagneri*

— Ziemlich matt. Flügeldecken dicht punktiert .... 16 a

16a Augen sehr gross, aus dem Kopfniveau stark hervortretend. Schläfen nur im Verhältnis 5½ : 3½ länger als die Augen 4. Fühlerglied nur etwa ⅓ breiter als lang .... *lohsei*

— Augen viel kleiner, nur wenig aus dem Kopfniveau hervortretend. Schläfen im Verhältnis 6 : 2½ länger als die Augen. 4. Fühlerglied fast doppelt so breit wie lang .... *kochi*

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Eingegangen 3 May 1968

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Notes on the Genus Placusa Erichson (Col., Staphylinidae), with a Key to the Nordic Species

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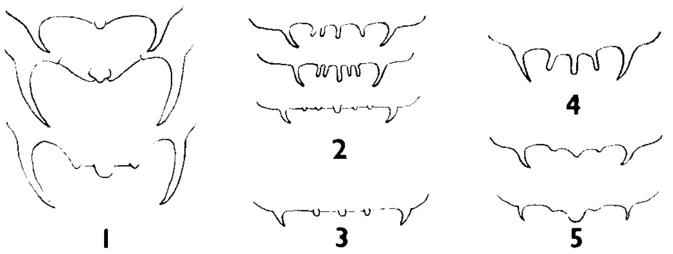
Abstract: JOHNSON, C. 1968. Notes on the genus Placusa Erichson (Col., Staphylinidae), with a key to the Nordic species. *Norsk ent. Tidsskr.* **15**, 90-92.
The status of some species of *Placusa* is discussed, and a key given to the Nordic species of the genus. Figures of the primary and secondary sexual characters of the species are also presented.

The members of the genus *Placusa* are very closely allied to each other, and the species as yet do not appear to have been limited from their congeners very precisely. In the main, previous workers have laid most emphasis on the male secondary sexual characters, that is, the denticulation of the posterior margin of tergite six for the diagnostic characters, but whilst it must be admitted that in most cases the males can be determined by these characters, no attempt appears to have been made to separate the females. Hansen (1954) in fact has admirably figured the male characters of the Fennoscandian species.

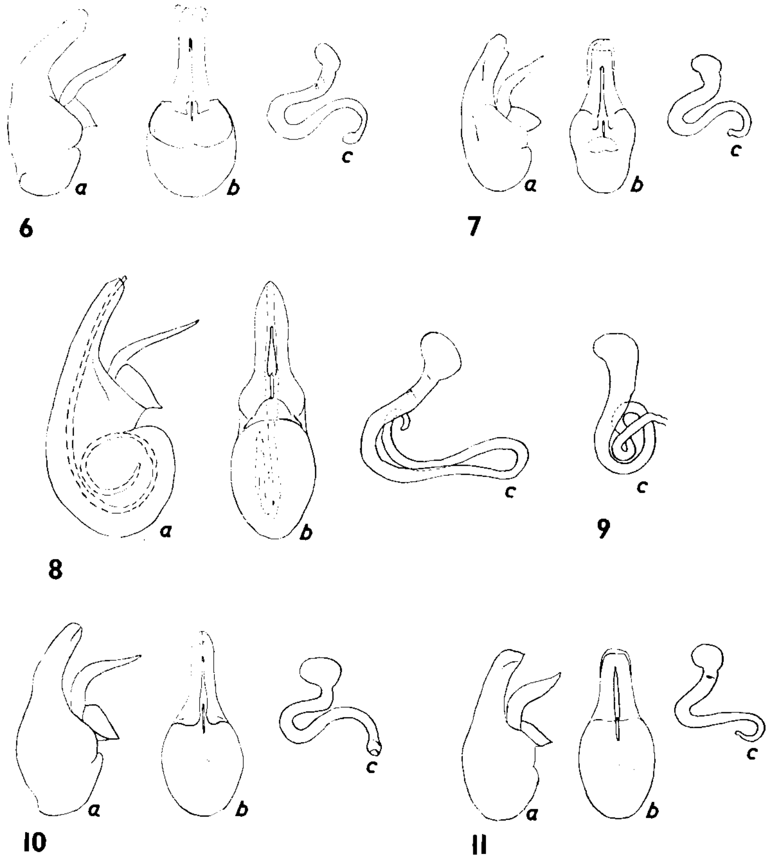
There seems to have been some confusion in the past concerning the names *complanata* Erichson and *humilis* Erichson. In his description of the genus *Placusa*, Erichson (1837/39) included a single species in it, *Aleochara pumilio* Gyllenhal but in his following work (Erichson 1839/40) he changed the name of this and described it as *humilis;* in addition he also gave a description of *P.pumilio* (Gravenhorst) which he clearly considered to be the same as Gyllenhal's species. Erichson's same work included descriptions of four other new species: *complanata, infima, despecta* and *adscita.* Kraatz (1856/7) included all Erichson's species with the exception of *despecta,* but he also added *carbonaria* Hampe. From this time confusion seems to have started. For example Reitter (1909) considered *complanata* Erichson to be a good species, with *humilis* Erichson as a synonym of it, and he distinguished *complanata* from its nearest ally *depressa* Mäklin, of which he considered *humilis* Kraatz to be a synonym. This treatment has been followed by Bernhauer & Scheerpeltz (1926). On the other hand, Hansen (1954) gives *humilis* Erichson as a synonym of *depressa,* and from studying Erichson's original description, the present writer considers Hansen to be correct in this course of action. It also seems dubious whether Kraatz's interpretation of *humilis* really differs from that of Erichson.

P. incompleta was described by Sjöberg (1934) on specimens from Sweden, and in his paper he gives figures of the male secondary sexual characters of this and *tachyporoides,* as well as a figure of the apex of the penis in both of these species. The present writer has studied the penis of these two species, which has been prepared by boiling in caustic potash solution, then being washed, and gradually brought into glycerine, but no real difference in form has been found which could separate the two species. It seems possible therefore that Sjöberg's figure of *incompleta* may have been drawn from a defective specimen.

Tottenham (1949), in his list of British



Figs 1-5, male tergite 6 of *Placusa* spp.: 1, *P. complanata* Erichson/*depressa* Mäklin; 2, *P. tachyporoides* (Waltl); 3, *P. incompleta* Sjöberg; 4, *P. atrata* Sahlberg; 5, *P. pumilio* (Gravenhorst).



Figs 6-11, primary sexual characters of *Placusa* spp.: 6, *P. complanata* Erichson; 7, *P. depressa* Mäklin; 8, *P. tachyporoides* (Waltl); 9, *P. incompleta* Sjöberg; 10, *P. atrata* Sahlberg; 11, *P. pumilio* (Gravenhorst). (a, penis viewed laterally; b, penis viewed ventrally; c, spermatheca).

Staphylinidae, has listed *denticulata* Sharp as a separate species. Previous workers (for example Reitter (1909), Bernhauer & Scheerpeltz (1926) and Joy (1932)) have been unanimous in treating it as a synonym of *tachyporoides*, along with *infima* Erichson. The type of Sharp's species is in the British Museum, London, and has been studied by the present writer: it is a large male and, as expected, is identical with *tachyporoides*.

Key to the Nordic Species of Placusa *Erichson.*

1 Pronotum very flat and dull, the granulation being fine and very close. Male tergite 6 Fig. 1. 2

— Pronotum more convex, shining, the granulation slightly coarser and less close. Male tergite 6 differently formed 3

2 Size larger, 2.5-3.0 mm; antennae longer, segment 3 about twice as long as broad; upper surface extremely dull; pronotum generally more ample. Penis and spermatheca Fig. 6. .... *complanata* Erichson

— Size smaller, 2.0-2.5 mm; antennae shorter, segment 3 less than twice as long as broad; upper surface dull, although not quite as much as in the preceding species; pronotum generally less ample. Penis and spermatheca Fig. 7. .... *depressa* Mäklin

3 Size larger, 2.0-3.0 mm; basal segments of antennae usually pale. Male: penis very large, with a pair of strongly sclerotised internal ducts; ventral spine long and slender, Fig. 8. Female: spermatheca with a rather long and dorsally-orientated tail, Figs. 8-9 4

— Size smaller, 1.5-2.0 mm; basal segments of antennae usually darker. Male: penis smaller, without any conspicuously sclerotised internal ducts; ventral spine shorter, broader and more angled, Figs. 10-11. Female: spermatheca smaller, the tail shorter and orientated ventrally, Figs. 10-11 5

4 Pronotum and elytra usually proportionately more ample. Male tergite 6 Fig. 2; penis and spermatheca Fig. 8, ... *tachyporoides* (Waltl.)

— Pronotum and elytra usually narrower. Male tergite 6 Fig. 3; spermatheca Fig.9, ... *incompleta* Sjöberg

5 Elytra usually darker. Male tergite 6 Fig. 4; penis and spermatheca Fig. 10. .... *atrata* Sahlberg

— Elytra usually lighter. Male tergite 6 Fig. 5; penis and spermatheca Fig. 11. .... *pumilio* (Gravenhorst)

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For the loan of material, the writer is indebted to the following colleagues: Dr. A. Strand, Oslo; Dr. S. Stockmann, Helsingfors; Dr. G. A. Lohse, Hamburg; and Mr. S. A. Williams, Dartford.

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Notes on Some Species of Atomaria s. str. (Col., Cryptophagidae) with Descriptions of Two Species New to Science

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Abstract: JOHNSON, C. & STRAND, A. 1968. Notes on Some Species of *Atomaria s. str.* (Col. Cryptophagidae) with Descriptions of Two Species New to Science. *Norsk ent. Tidsskr.* **15**, 93-96.
Specimens of some Central European species of *Atomaria* s. str. have been compared with the same Nordic ones, with the result that *A. bella* sensu Lohse from Germany is described as a new species under the name *lohsei* sp. n.; a lectotype and paralectotype of *bella* Reitter are also designated. A second new species, *A. pseudaffinis* sp. n., is described from Norway and Sweden. The paper concludes by giving the characters whereby the little-known species *A. norica* Ganglbauer from the eastern Alps can be distinguished from its congener *A. subangulata* Sahlberg.

Lohse (1967) has recently published a revised key to the central European species of *Atomaria*, and has sent to us a number of species in order to ascertain whether or not our interpretations of these species in northern Europe conform with his own. The species in question are *affinis* Sahlberg, *alpina* Heer, *subangulata* Sahlberg, *bescidica* Reitter, *bella* Reitter and *atrata* Reitter. After studying his specimens, we feel that Dr.Lohse's interpretations do not differ from our own, with the exception of his *bella* which we consider to be specifically distinct from the nordic species. A specimen of *subangulata* from Nordtirol, Austria, is a little teneral, but it is probably correctly interpreted as Sahlberg's species.

In passing, it may be mentioned that Dr. Lohse has studied the male holotype of *Atomaria (s.str.) strandi* Johnson, a species recently described from the British Isles and Norway (Johnson 1967), and has confirmed that it represents a previously undescribed species.

The identity of A. bella Reitter

The specific distinctness of Lohse's *bella* from *bella* as we perceive it has necessitated an examination of Reitter's original material. Reitter's collection of Cryptophagidae is conserved in the Muséum National d'Histoire Naturelle, Paris, and we have been privileged to study the material of *bella* from this collection. Six specimens are included, representing three different species. These are *nigriventris* Stephens—three specimens with the data 'Roumanie, Comana Vlasca, A.L.Montandon'; *munda* Erichson—a single specimen labelled 'coll.Desbr., Allemagne, type de Reitter, *Atomaria bella*' (which cannot be a 'type' as it does not conform to Reitter's description); and two specimens of *bella* as understood by us, i.e. sensu Sjöberg (1947) .The first of these *bella,* which we herewith designate as Lectotype, bears a handwritten label '*bella* m., Schlesien, Kraatz', three printed labels—'170', 'coll. Reitter', and 'Type' respectively, and a further handwritten label (apparently in Reitter's hand) '*Bella* Reitt., G.S.'. This specimen is a female. The second specimen of *bella*, a further female (from which we have dissected out and mounted the spermatheca) bears a handwritten label '— 9 Ripau ' (which we cannot decipher), and two printed labels—'Coll. Reitter' and 'Type', as possessed by the previous specimen. We herewith designate this second specimen as Paralectotype.

Accordingly, it now becomes necessary to describe the '*bella*' of Lohse as a new species, which we dedicate to our colleague under the name *lohsei* sp.n.

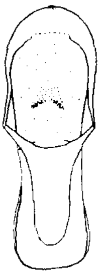
Atomaria (s.str.) lohsei sp.n.

(Figs. 2 and 4)

So closely allied to *bella* Reitter (Figs. 1 and 3) that it can best be described by a comparison with that species.

Colour very much paler than in *bella*, predominantly yellowish: five of the specimens are entirely yellowish, the other with the pronotum a very pale reddish-yellow and with the elytra a slightly darker reddish-yellow. The usual colour of *bella* is head, pronotum and humeral angles of the elytra much darker, reddish or reddish-brown, the elytra (often excluding the apex) a darker brown and varying through shades to an almost blackish coloration; some specimens from northern Sweden have the head, pronotum and humeral angles of the elytra brown-blackish, only slightly lighter than the predominantly blackish elytra. On account of the very pale pronotum in *lohsei*, its pale pronotal pubescence is a little less conspicuous than that in *bella*, and the surface of the pronotum seems slightly more shining.

Male: penis broader and a little more straight-sided in the apical half than in *bella*, with the apical contraction commencing much closer to the sides, and the apex of a slightly different form. Paramere plate rather more angled at the shoulders and at the apex than in *bella*. (The apex in two of the *lohsei* is somewhat strongly nippled, but not in the third male) (Figs. 1-2: the minute setae at the apex of the paramere are omitted)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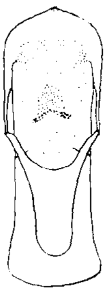
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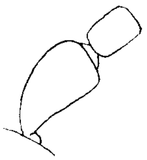
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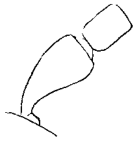
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Figs. 1-2. Aedeagi of *Atomaria* spp.: 1, *A. bella* Reitter; 2, *A. lohsei* sp. n. Figs. 3-4. Spermathecae of *Atomaria* spp.: 3, *A. bella*; 4, *A. lohsei*. Figs. 5-6. Base of antennae of *Atomaria* spp.: 5, *A. affinis* Sahlberg; 6, *A. pseudaffinis* sp. n. Figs. 7-8. U-shaped sclerite in apical half of penis of *Atomaria* spp.: 7, *A. subangulata* Sahlberg; 8, *A. norica* Ganglbauer

Female: spermatheca more open and slender, more evenly curved, not acuminate nor downwardly directed at the apex as is the case with *bella*. (Figs. 3-4)

Holotype ♂: GERMANY—Holstein, Kr. Segeberg, Kartenholm, 17.ix.61, leg. G. A. Lohse.

Paratypes: GERMANY—Hamburg, Rosengarten, 27.iv.49, leg. G. A. Lohse, 1 ♀; Darmstadt, 1.8.1961 (nr. 493), leg. H. Vogt, 1♂ 1♀, same data but 31.7.1961, 1 ♀; Überlingen-Bodensee, 21.3.46, leg. A. Horion, 1 ♂.

Holotype and paratype in coll. Lohse, paratypes in coll. Lundberg (1), coll. Vogt (1), and single ones in our collections.

Atomaria (s.str.) pseudaffinis sp.n.

(Fig. 6)

Very closely allied to *affinis* Sahlberg and *sahlbergi* Sjöberg, and best described in a comparison with these two species (Table I).

Table I. *A comparison between A. affinis* Sahlberg, *A. sahlbergi* Sjøberg *and A. pseudaffinis* sp. n.

affinis	*pseudaffinis* sp. n.	*sahlbergi*
Antennae rather thick, the first segment weakly curved and not so slender at the base (Fig 5).	Antennae more slender, the first segment more strongly curved and more slender at the base (Fig. 6).	Antennae as in *affinis.*
Pronotum slightly narrower than the elytra, not shagreened; basal region close to hind angles not flattened.	Pronotal width as in *affinis*, the surface shagreened; basal region close to hind angles rather flattened.	Pronotum much narrower than the elytra, shagreened; basal region as in *pseudaffinis*
Elytra rather long and narrow, broadest a little before the middle, very finely punctured; bicolorous, the discal area conspicuously darkened with a transverse band.	Elytra shorter and broader, broadest farther behind the middle, somewhat strongly punctured; unicolorous, without a darkened discal band.	Elytra similar to those of *affinis*, but broadest usually at the middle, rather strongly punctured; unicolorous.

The primary sexual characters of *pseudaffinis* do not appear to show any significant differences from those of *affinis*, as far as we are able to see from the few specimens available for study.

Holotype ♂: NORWAY—Rundhaug M. elv., 13.6.37, 'on *Polyporus* on birch' leg. A. Strand.

Paratypes: NORWAY—same locality but 17.6.37, 2 ♀♀, 15.6.38, 1 ♂, leg. A. Strand; Røa V.Aker, 2.iv.42, 'in flight', leg. A. Strand, 1 ♀. SWEDEN—Flona, Dalarne, Kläbergets fäb., 1.4.61, leg. T. B. Ehnström, 1 ♂; Båtfors, Upland, 4.11.61, 'under bark of *Picea abies*', leg. S. Lundberg, 1 ♀.

Holotype and paratypes (3) in coll. Strand, single paratypes in colls. Lundberg, Ehnström and Johnson.

Atomaria (s.str.) norica Ganglbauer
(Fig. 8)

According to Lohse (1967), this species of the eastern Alps is closely allied to *subangulata* Sahlberg, the aedeagi not being separable, from which *norica* differs in the thicker and more rasp-like pronotal puncturation, and somewhat more slender antennae.

We have studied a number of our colleague's specimens of *norica* and find it to be (like most species) quite variable. It seems to us however, that *norica* and *subangulata* may be separated as a rule by the following combination of characters (we cannot find any difference in the antennal thickness):

1. More depressed species; colour dark brown, each elytron with a lighter streak extending from the humerus to beyond the disc; elytral puncturation coarser; pronotum flat, more coarsely and less closely punctured, sides generally more contracted in the basal half; pronotum slightly broader. Male: u-shaped internal sclerite in the apical half of the penis narrower, more closed (Fig.7)
   subangulata Sahlberg
— More convex species; colour of a much lighter brown, elytra unicolorous, without the lighter streaks; elytral puncturation finer; pronotum markedly convex on the disc, more finely and closely punctured, sides not so contracted basally; pronotum slightly narrower. Male: u-shaped internal sclerite in the apical half of the penis broader, more open (Fig.8).
   norica Ganglbauer

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For the loan of material, our thanks are due to the following colleagues: Dr. G.A.Lohse, Hamburg; Dr. H.Vogt, Darmstadt; Mr. Stig Lundberg, Stockholm; Mr. M. Schmaus. Kastellaun; Mr. A. von Peez, Brixen; Mme A. Bons, Muséum National d'Histoire Naturelle, Paris.

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Et omdannet følehorn hos en tege og omdannet bakbein hos to biller

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Abstract: SIGMUND HÅGVAR, 1968. Et omdannet følehorn hos en tege og omdannet bakbein hos to biller (A deformed antenna in a bug and deformed hindlegs of two beetles). *Norsk ent. Tidsskr.* **15,** 97-98. A deformed antenna in a specimen of *Drymus brunneus* Sahlb. is described. Deformed hindlegs have been observed in *Phosphuga atrata* L. and *Patrobus assimilis* Chaud.

Omdannet følehorn hos *Drymus brunneus* Sahlb.

En *Drymus brunneus* ♂ (Heteroptera, Lygaeidae), funnet 27/4 1968 under gammelt løv ved Valler, Bærum, hadde sitt høyre følehorn omdannet, mens det venstre var normalt. Fig. 1 viser dyrets to følehorn. Det høyre hadde bare tre ledd, hvorav de to ytterste var forlenget, slik at følehornet ble nesten like langt som det venstre. Som føleorgan fungerte det derfor sikkert normalt.

Leddenes form og fargetegninger kan indikere at den tre-leddete føler ikke har oppstått ved tap av endeleddet på et tidlig stadium. De to følehorn er nemlig som helhet meget like. Den innerste halvdel (dvs. de to innerste ledd hos det normale følehorn, og 1. ledd samt innerste ¾ av det mellomste ledd i det omdannede følehorn) er mørkebrun, mens ytre del er svart. Helt ytterst har begge følehorn lys, avsmalnet spiss.

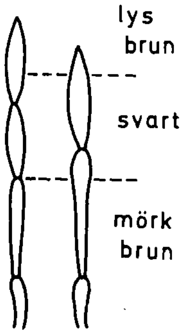

Fig. 1. Normalt og unormalt følehorn hos *Drymus brunneus* Sahlb.

Man kunne derfor tenke seg at 3. ledd har forsvunnet (på et tidlig stadium i utviklingen) ved at det har delt seg omtrent på midten og smeltet sammen med henholdsvis 2. og 4. ledd. På den måten forklares at det ytterste leddet i spissen er som et normalt siste ledd, og at midtleddet ytterst blir fortykket til tykkelsen av et normalt 3. ledd, samtidig som fargen skifter til svart, som er normal farge på 3. ledd.

Leston (1952) har hos samme art beskrevet et individ der høyre halvdekkvingen var forkortet, mens den venstre var normal. Hos denne og noen nærstående arter forekommer av og til individer der begge vingene er forkortet. Dette tilfellet av unilateral kortvingethet kan imidlertid Leston ikke gi noen tilfredsstillende forklaring på.

Omdannet bakbein hos *Phosphuga atrata* L.

Hos en *Phosphuga atrata* (Col., Silphidae), funnet under stein i granskog på Kolsåsen, Bærum 9/4 1968, var det høyre bakbeinet omdannet. Fig. 2 viser det omdannete bakbeinet (B) sammenlignet med et normalt bein (A). Coxa og trochanter er normale og er ikke tegnet. Femur og tibia er forkortet. Tibias endetorner mangler. Tarsen mangler et ledd. De

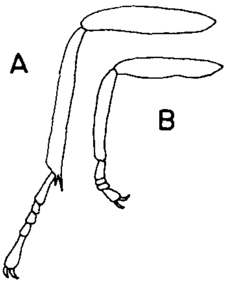

Fig. 2. Normalt (A) og unormalt (B) høyre bakbein av *Phosphuga atrata* L.

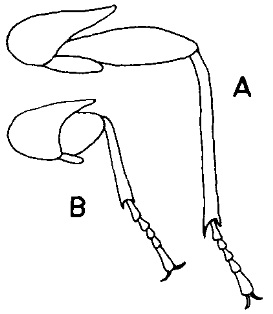

Fig. 3. Normalt (A) og unormalt (B) venstre bakbein av *Patrobus assimiis* Chaud.

gjenstående 4 ledd er dessuten forkortet, slik at tarsens hele lengde blir bare omtrent halvparten av det normale.

Omdannet bakbein hos *Patrobus assimilis* Chaud.

Fig. 3B viser et omdannet venstre bakbein hos en *Patrobus assimilis* (Col., Carabidae), funnet under stein ved Krossbu, Sognefjell, 7/7 1965, 1450 m o. h. Coxa er nesten normal. Trochanter er meget forminsket og i nesten hele sin lengde sammenvokst med femur. Femur er omtrent kuleformet og forkortet til ca. $\frac{1}{3}$ av normal lengde. Tibia er forkortet og har mindre endetorner enn normalt. Tarsen er normal.

I alle disse tilfellene er bare visse deler av følehornet eller beinet omdannet, mens i det minste en liten del av det er normalt. Da dyrene ellers er uten misdannelser, er det nærliggende å tenke seg en lokal infeksjon eller skade som primær årsak til disse dannelsene.

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Leston, D., 1952. Unilateral brachypterism in Drymus brunneus Sahlb. (Hem., Lygaeidae). *Ent. mon. Mag.* **88,** 206.

Mottatt 30. mai 1968

Weiterer Beitrag zur Kenntnis der Verbreitung und Ökologie von Käfern im zentralen Südnorwegen

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Abstract: FRIDÉN, A. 1968. Weiterer Beitrag zur Kenntnis der Verbreitung und Ökologie von Käfern im zentralen Südnorwegen. *Norsk ent. Tidsskr.* **15**, 99-104.

Ausser verschiedenen Gebieten in den Gebirgsgegenden Skandinaviens hat der Verfasser einen Talabschnitt bei dem mächtigen Gebirgsmassiv Jotunheimen untersucht. Das Tal liegt unter dem 61 Breitengrade. Nur die terrestrische Fauna wurde beachtet und ausser der Zusammensetzung im allgemeinen vor allem die Höhengrenzen studiert. Die Fauna ist von Binnenlandcharakter. Die echten Gebirgsarten sind ziemlich viel aber nicht so zahlreich wie in nahegelegenen nördlichen Gegenden. Die Höhengrenzen sind unter den am höchsten gelegenen Skandinaviens. Gewisse Vergleiche sind mit einem Gebiet im südlichen schwedischen Lappland unter dem 66 Breitengrade, das früher verhältnismässig gut untersucht wurde, gemacht. Die Faunen der beiden Gebiete sind offenbar etwas verschieden. Der Unterschied bei den Höhengrenzen ist grösser als der, welchen man aus dem Breitengradunterschied berechnet. Dies dürfte mit dem kontinentalen Klima des inneren südlichen Norwegens zusammenhängen.

HINTERGRUND UND ZIEL

In einer früheren Arbeit (Fridén 1961 a) gebrachte Resultate und Betrachtungen werden hier weitergeführt. Ich habe in Mehreren Arbeiten ähnliche Probleme der skandinavischen Käferfauna behandelt und in zwei vorhergehenden (Fridén 1965, 1967) die angrenzender Gebiete.

Im vorliegenden Falle ist es meine Meinung gewesen, Artenbestände und Probleme der Höhengrenzen eines hoch gelegenen Tales von einem der am kontinentalsten gelegenen Gebiete der skandinavischen Gebirgskette zu studieren. Ich habe jedoch nur terrestrische Käfer beachtet. Als Hintergrund habe ich besonders eine frühere Arbeit (Fridén 1956).

DAS GEBIET

Der untersuchte Talabschnitt (Fig. 1; Breitengrad 61) umfasst den höchsten Teil von Valdres von 750 m Höhe ab (On) und die nächste Fortsetzung dieses Tales westwärts gegen den Sognefjord bis 725 m (SFi). Es handelt sich um eine Strecke von ca. 30 Km. Die Passhöe ist etwas mehr als 1000 m, und der Wald erreicht dort stellenweise 1150 m. Eine Landstrasse geht durch das Tal. Es gibt keinen erwähnenswerten Nadelwald im untersuchten Gebiet trotz des kontinentalen Klimas. Angrenzende alpine Gebiete habe ich in der obenerwähnten Arbeit behandelt (Fridén 1961 a).

Wie in gewissen früheren Arbeiten (wie Fridén 1967) will ich zuerst die gut untersuchten Gefässpflanzen des Vergleichs halber ein wenig abhandeln. Die Sperrwirkung der Gebirgskette hat zur Folge, dass die euozeanischen Arten ganz fehlen und dass subozeanische nur vereinzelt vorkommen. Während meiner Exkursionen habe ich, ein wenig überraschend, die subozeanische Art *Blechnum spicant* einmal gesehen (Fridn 1961 b). Zufolge des verhältnismässig kontinentalen Klimas erreichen die Gefässpflanzen in diesen Gegenden gewöhnlich ihr entschieden am höchsten Niveau in Skandinavien. Die Flora ist jedoch nicht besonders reich an wirklichen Gebirgspflanzen

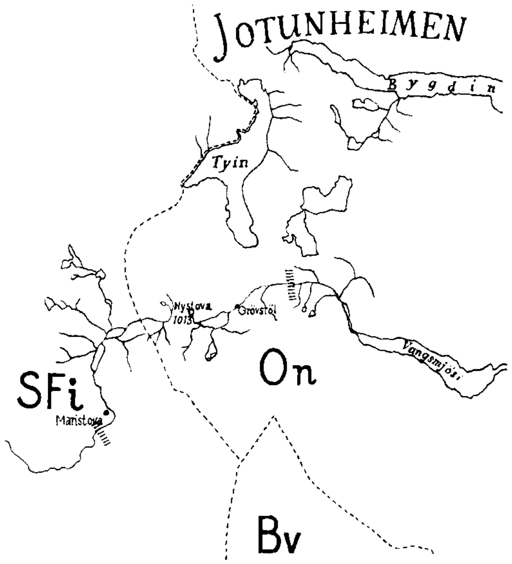

Fig. 1. Der untersuchte Talabschnitt (Passhöhe 1013 m) durch kleine Striche abgegrenzt. Betreffe der Abkürzungen Bv, On und SFi vgl. LINDROTH (1960)

trotz der Nähe eines ziemlich mächtigen Gebirgsmassives (Jotunheimen) mit grosser Durchschnittshöhe. Viele Arten haben nämlich ihre Südgrenze in nördlicheren Gegenden, und andere haben hier eine Verbreitungslücke. Gewisse unicentrische und bizentrische Arten finden sich indessen hier. Viele skandinavische Arten mit einer Verbreitung südlichen Charakters und mit einem auffälligen Vorkommen in anderen Teilen der Gebirge Skandinaviens kommen im hoch gelegenen untersuchten Talabschnitt kaum und im westlichen Norwegen vielfach auch nicht vor (Gjaerevoll 1963, Hultén 1950). Die endemischen *Papaver radicatum,* ssp. *relictum* (Gjaerevoll 1963) und *Poa arctica* spp. *elongata* (Nannfeldt 1963) sind in Valdres gefunden.

Man erwartet ähnliche Verhältnisse betreffs der Verbreitung der Tiere.

WESENTLICHE ERGEBNISSE

Ich bespreche hier nur gewisse Arten von Interesse.

Neulich habe ich echte Gebirgsarten etwas behandelt, aber in küstennahen Gebieten (Fridén 1967). Es ist ja eine wohlbekannte Tatsache, dass deren Anzahl in Skandinavien etwas grösser in Gegenden, nördlich von den jetzt untersuchten, ist. Gewisse Arten von bizentrischem oder unizentrischem Verbreitungstypus sind nämlich bei Dovre und Trollheimen begrenzt oder finden sich auch in Nord-Jotunheimen (Hultén 1950). Indessen haben sich *Agonum consimile* Gyll., *Bembidion fellmani* Mnh. und *B. hasti* Sahlb. als häufig erwiesen (vgl. Lindroth 1945), während sie im westlichen Norwegen nur stellenweise oder selten gefunden sind (l.c., Fridén 1965 und 1967). Als nicht so häufig oder selten erwiesen sich *Arpedium brunnescens* J. Sahlb., *Acidota quadrate* Zett., *Atheta brunneipennis* Th., *Boreaphilus henningianus* Sahlb., *Bryoporus rugipennis* Pand., *Helophorus glacialis* Villa (vgl. Holdhaus & Lindroth 1939 p.267), *Hypnoidus rivularis* Gyll,. *Lesteva monticola* Kies., *Miscodera arctica* Payk., *Mycetoporus monticola* Fowl., *M. niger* Frm., *Olophrum rotundicolle* Sahlb., *Oxypoda lugubris* Kr., *Patrobus septentrionis* Dej. und *Stenus fasciculatus* J. Sahlb. Von diesen haben jedenfalls gewisse im westlichen Norwegen offenbar Lücken in ihrer Verbreitung (Lindroth 1960, Fridén 1965, 1967).

Wenn auch der Artbestand im untersuchten Gebiet ziemlich gross ist, scheinen offenbar gewisse Gebirgsarten dort zu fehlen (vgl. Lindroth 1945, 1960). Mithin fand ich nicht *Atheta frigida* Sahlb., *Bembidion difficile* Mtsch., *B. grapei* Gyll., *B. prasinum* Dft., *Olophrum boreale* Payk., *Pterostichus adstrictus* Esch. und *Trichocellus cognatus* Gyll. Vielleicht erreicht *Pterostichus adstrictus,* der auch ausser der eigentlichen Gebirgskette grosse Verbreitung hat (Lindroth 1945), nicht diese Höhen. Die hochalpine Art *Nebria nivalis* Payk. ist in der Nähe gefunden (l.c.).

Vorher habe ich schon betont, dass gewisse Uferarten durch Wasserregulierungen dezimiert worden sind (Fridén 1964 p.211). Es ist ganz ersichtlich, dass stenotope Uferarten, die sich an der Wasserlinie aufhalten, z.B. *Pelophila borealis* Payk., für grössere Veränderungen des Wasserniveaus besonders empfindlich sind. Die Schwierigkeit, die genannte Art, auch *Nebria rufescens* Str. (stenotop; 1 Lokal) zu finden, erhält mithin vielleicht ihre Erklärung.

Im vorliegenden Fall habe ich die Erfahrung gemacht, dass die fraglichen stenotopen Uferarten westlich von der Wasserscheide häufiger waren. Östlich davon waren die Gewässer des Talbodens reguliert. Alle *Bembidion bipunctatum* L. und *B. virens* Gyll. wurden westlich der Passhöhe gefunden, von *B. hasti* alle ausser 1 Stück, von *B. fellmani* ⅔.

Der Charakter des Klimas sollte sich etwas im Jahreswechsel der Tiere zeigen. Überwinterung als Imago verlangt einen warmen Sommer (Lindroth 1949 p.477). Für gewisse Arten habe ich auch gegen Ende der Saison (Ende August, September) einen beträchtlichen Prozentsatz neugeschlüpfter Tiere festgestellt (Tab. I). Von übrigen Arten ist das Material nicht gross genug für weittragende Schlüsse.

EIN VERGLEICH MIT EINEM ANDEREN SKANDINAVISCHEN GEBIET

Als Vergleichsgrund habe ich ein Gebiet genommen, das ich in einer obenerwähnten Arbeit (Fridén 1956) behandelt habe. Das Gebiet ist in Lycksele lappmark (Ly Lpm) im Südlichen schwedischen Lappland unter dem 66 Breitengrade gelegen. Ich habe da die Fauna von einigen Gebirgstälern verglichen und u.a. die Höhengrenzen studiert.

Tab. I. *Prozentsatz neugeschlüpfter Tiere (aus Ende August + September)*

Agonum fuliginosum	34
Arpedium brachypterum Gr.	43
Atheta microptera Th.	12
Lathrobium brunnipes F.	36
Olophrum fuscum	20
Oxypoda procerula Mnh.	20
Patrobus assimilis Chd.	25
Pterostichus diligens Sturm	18

Tab. II. *Die gefundenen Höhengrenzen gewisser Käferarten in den untersuchten Gebieten von On + SFi und Ly Lpm. b=brachypter*

	On+SFi	Ly Lpm
Agonum fuliginosum Panz. b	980	575
Bembidion virens Gyll.	1000	650
B. rupestre L.*	1000	655
B. bipunctatum L.*	1000	715
B. saxatile Gyll.	875	470
Myllaena kraatzi Sharp	1025	670
Notiophilus biguttatus F.*b	950	750
N. germinyi Fauv.*b	1050	710
Olophrum fuscum Gr.*	800	550
O. consimile Gyll.*	980	675
Oxypoda lateralis Mnh.	950	620
Pterostichus nigrita F.	1000	490
Stenus palustris Er.	1000	460
Tachinus corticinus Gr.*	950	750

In der folgenden Tabelle (II) habe ich für eine Auswahl von Arten die Höhengrenzen in den beiden Vergleichsgebieten angegeben. Von gewiss zufälligen Funden wird abgesehen.

Der Breitengradunterschied ergibt nach Ångstrøm (1958, Tab. V) betreffs der Höhengrenzen in den beiden Gebieten eine durchschnittliche Differenz von ca. 170 m. Diese wird somit beträchtlich übertroffen (die durchschnittliche Differenz wird 350 m).

Die mit * bezeichneten Arten wurden jedoch in einem hochgelegenen und artenarmen Tal im untersuchten Gebiet von Ly Lpm (Fridén 1956 p.40) angetroffen. Die Höhenlage dieses Tales (Talboden 640-670 m) entspricht im On + SFi-Gebiet nach obigen Berechnungen etwa 810-840 m (ein Vergleich des allgemeinen Charakteres der Vegetation der beiden Gebiete erweist jedoch kaum dies). Die übrigen kommen wahrscheinlich da nicht vor, aber erreichen in On durchschnittlich hohes Niveau. Interessant ist der Unterschied bei *Agonum fuliginosum* (eurytop aber brachypter).

Ein Vergleich der beiden Gebiete betreffs der Waldgrenze ergibt ungefähr denselben Unterschied. Den Grund dieses Umstandes habe ich schon erörtert (die Massenerhebung und das verhältnismässig kontinentale Klima; Fridén 1959 p.207-208, 1961 p.273). Die ursprünglichen Verhältnisse sollten u.a. durch die Landstrasse beeinflusst worden sein, aber die oben angefürthen Arten sind nicht synanthrop.

Mit Bezug auf die Höhengrenzen sind unter anderen Funden in On + SFi zu nennen: *Autalia puncticollis* Sharp (1000 m), *Latrimaeum atrocephalum* Gyll. (760), *Mycetoporus splendidus* Gr. (1000), *Syntomium aeneum* Müll. (940), *Tachinus marginellus* F. (760) und *Tachyporus pusillus* Gr. (950), die in Ly Lpm nicht oder, ausser *Mycetoporus splendidus,* nur in niedrigem Niveau und dann sporadisch angetroffen wurden (Fridén 1956), weiter auch *Atheta granigera* Kies. (730, Maristova) und *A. eremita* Rye (1000, Nystova).

Von Ly Lpm (Fridén 1956) habe ich gewisse Arten erörtert, die ich in On + SFi nicht angetroffen habe. Die folgenden scheinen mir von Interesse (Tab. III).

Die zuletzt erwähnten haben in Ly Lpm etwas niedrigere Höhengrenzen als die Arten der obigen Gruppe (Tab. II). Nur *Trechus obtusus* wurde in den höheren Teilen des Birkengürtels angetroffen (Fridén 1956).

Lindroth (1965) vergleicht zwei geographisch gut getrennte Gebiete, Island und den europäischen Kontinent, betreffs der Verbreitung gewisser Käferarten im Verhältnis zum Klima und findet dabei grosse Übereinstimmung.

Tab. III. *Eine Auswahl von Arten in Ly Lpm, die im On + SFi-Gebiet nicht angetroffen wurden. Die Zahlen sind die Höhengrenzen*

Drusilla canaliculata F. b	650
Bembidion lampros Hbst.	525
Clivina fossor L.	615
Dyschirius globosus Hbst. b	635
Leistus rufescens F. b	600
Pterostichus oblongopunctatus F.	550
Patrobus atrorufus Ström b	540
Sipalia circellaris Gr. b	650
Trechus rubens F.	450
T. obtusus Er. b	750

SCHLUSSBETRACHTUNGEN

Die relativ grosse Zahl eigentlicher Gebirgsarten im untersuchten Gebiet dürfte mit dem hochalpinen Charakter von Jotunheimen zusammenhängen. Die nahegelegenen spitzigen Gipfel dieses Massives könnten während der Eiszeit eisfrei (Nunatake) gewesen sein (vgl. Hoppe 1963). Gjaerevoll (1963 p.278) hat auf Grund der Verbreitung gewisser Pflanzen eine derartige Theorie aufgestellt. Diese Refugien im Binnenland könnten sowohl als die der Küste, aber in geringem Masse, für gewisse Arten Sammelplätze gewesen sein (vgl. Brinck 1966 p.127). Aus diesen Bereichen könnten sich die Tiere über die angrenzenden Gebiete verbreitet haben, wodurch gewisse Arten (vgl. oben) gerade hier grosse Häufigkeit erreicht haben (dieser Unterschied dürfte seinen Grund nicht in intensiven örtlichen Untersuchungen haben; (Lindroth 1949 p.421). Wahrscheinlich war das Klima jedoch für sehr wenige Arten erträglich (l.c. p.772). Versuche mit Pflanzen aus Gebieten mit kaltem Klima, z.B. mit *Silene acaulis* und *Juncus trifidus,* zeigen indessen, dass sie grosse Beanspruchungen ertragen können (Löve 1963 p.203). Es ist ja auch schwer, sich ausgeprägte Uferarten, z.b. *Bembidion hasti,* als Überwinterer vorzustellen.

In peripheren Gebirgsabschnitten von gerundeter Gestalt, z.B. in Telemark und Dalarne, sind die echten Gebirgsarten recht wenig, obgleich die Höhenverhältnisse ziemlich günstig sein können.

Zusammenfassend muss betont werden, dass genaue Schlüsse schwer zu ziehen sind, da gewisse angrenzende Gebiete nicht genügend erforscht sind (Lindroth 1949 p.421). Indessen sind unter vielen hier vorkommenden skandinavischen Gebirgsarten gewisse häufig, z.B. *Bembidion hasti,* während mehrere Arten mit weiter Verbreitung in den skandinavischen Gebirgen hier nicht vorzukommen scheinen.

Mithin habe ich gewisse Arten nicht angetroffen, und sichere Funde von *Bembidion difficile, B. grapei, Dyschirius septentrionum* Munst. und *Trichocellus cognatus* gibt es erst ziemlich weit von hier (Lindroth 1945). Im Vergleich mit Nordskandinavien ist der Endemismus womöglich noch schwächer (vgl. Strand 1946 p.628). Unter Pflanzen gibt es doch Beispiele (vgl. oben). Arten mit ausgeprägt westlicher Verbreitung und grosser Frequenz an der Küste habe ich nicht gefunden, und man muss solche eingehend nachsuchen, um sie überhaupt finden zu können, z.B. *Atheta currax* Kr., diet meist auch die Birkenstufe erreicht (vgl. auch Fridén 1965), und *Otiorrhynchus arcticus* O.Fbr. (vgl. Holdhaus & Lindroth 1939 p.253). Dies entspricht dem kontinentalen Charakter des Klimas. Aus verschiedenen Gründen, u.a. wegen kurzer Entfernung von tief gelegenen Gegenden sowohl ostwärts als westwärts, haben gewisse Arten im Tal hohes Niveau erreicht (vgl. oben: ausserdem u.a. auch *Pterostichus lepidus* Leske, Lindroth 1945). In Skandinavien erreichen auch Talarten das höchste Niveau in zentralen Gegenden von Südnorwegen. Ob Arten mit isoliertem Vorkommen im inneren Sogn, z.B. *Agonum assimile* Payk. und *A. sexpunctatum* L. (Lindroth 1945), dorthin durch das Tal gekommen sind, ist die Frage. Ich habe indessen keine Funde, die dies erläutern. Von anderen Arten, z.B. *Amara brunnea* Gyll., *Blethisa multipunctata* L. und *Trechus rubens* F. (1.c.), sind im erwähnten ziemlich wohl untersuchten Gebiet (Lindroth 1949 p.421) und überdies in weiten Teilen des westlichen Norwegens keine Funde bekannt, obgleich die letztgenannten Arten östlich der Wasserscheide ziemlich hoch steigen (Lindroth 1945). Mithin scheinen sie vom Osten her ins Tal gekommen zu sein, aber haben das untersuchte Gebiet nicht erreicht. So etwas wurde oben für pflanzen betont. Betreffs der Käferfauna, die entschieden schlechter erforscht ist, sind die Verhältnisse schwerer zu überblicken. Die grosse Anzahl von wärmebedürftigen Arten, die sich im Storlien-Tal in Jämtland finden (Hultén 1950, Lindroth 1945) hat nach meinen Untersuchungen nicht ganz ihr Gegenstück hier. Die Naturverhältnisse sind im grossen und ganzen mit denen vom Tale in On-SFi übereinstimmend, aber im erstgenannten sind Arten wie *Agonum piceum* L., *Amara bifrons* Gyll. und *Bradycellus collaris* Payk. gefunden (Lindroth 1945). Die Wasserscheide dieses Tales ist jedoch in einer Höhe von 605 m gelegen.

Bei Beurteilung der Resultate dürften Wasserregulierungen beachtet werden.

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Die Genitalorgane der nordischen Arten der Gattung *Aleochara* Grav. (Col., Staphylinidae)

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ANDERS VIK
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Palm (1946) hat die nordischen Arten der Gattung *Aleochara* ausführlich erörtet und u. a. Zeichnungen des Aedeagus einiger Arten gegeben.

In einer *Aleochara*-Arbeit hat Likovsky (1965a) Zeichnungen des Aedeagus von sämtlichen tschechoslowakischen Arten publiziert.

Nachdem Palms Arbeit publiziert wurde, sind drei für die nordische Fauna neue Arten zugekommen und zwar *maculata* Bris., *stichai* Likovsky (1965b) und *peeziana* Lohse (1961). *Stichai* und *maculata* sind früher als neue für die nordische Fauna publiziert worden, vgl. Strand (1966) und Karppinen (1967).

Neulich machte v. Peez (i.l.) darauf aufmerksam, dass ein Exemplar von *peeziana*, das dem Naturhistorischen Museum in Wien gehört, und das er untersucht hat, den Fundzettel »Norv. b. Südvaranger 69° n. B. Pasvik-Järvi leg. G. Nietsch 7-44« trägt.

Peeziana kommt *lanuginosa* am nächsten, und eine Verwechselung mit dieser Art liegt nahe. Sie unterscheidet sich von ihr vor allem durch Mikropunkte am Kopf und Halsschild, durch weitläufigere Punktierung der Deckflügel und durch viel feiner punktierte hintere Hälfte der Tergite.

In Norwegen ist *lanuginosa* weit ausgebreitet, nordöstlich bis Alta, etwa 70° N 23° 30′ O, während der Fundort für *peeziana* weit östlicher (etwa 30° O) liegt.

In unserem norwegischen Materiale kommt *peeziana* nicht vor, und wir kennen keine anderen norwegischen Funde als den oben erwähnten. v. Peez (i. l.) hat auch Exemplare von *peeziana* die von Nietsch in zwei finnischen Lokalitäten gefunden sind, untersucht.

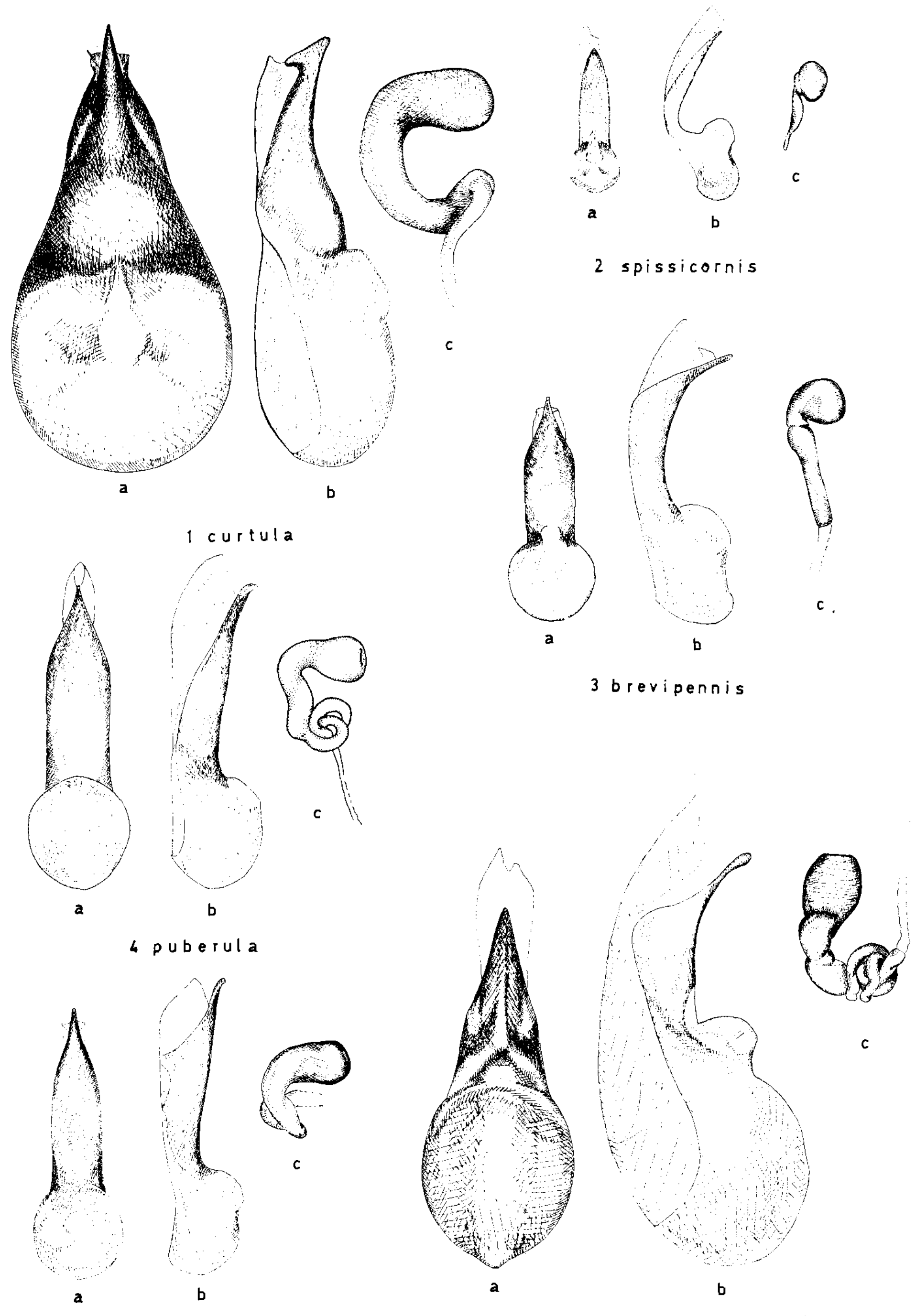
Unsere Zeichnungen (Fig. 1-31) umfassen alle Arten die aus den nordischen Ländern bekannt sind, ausgenommen *pulchra* Kr., die in Schweden in einem Exemplar gefunden wurde, und die sonst nur aus Turkestan bekannt ist. Der schwedische Fund muss als zufällig angesehen werden.

Da es sich erwiesen hat, dass auch die Samenkapsel bei der Bestimmung der Arten gute Hilfe leisten können, sind auch sie gezeichnet worden.

In der folgenden, alphabetischen Liste der Arten geben die Zahlen die Nummer der Figuren an:

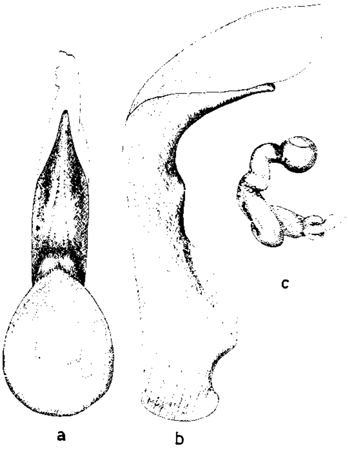
30 *algarum* Fauv.
25 *bilineata* Gyll.
26 *bipustulata* L.
3 *brevipennis* Gr.
28 *brundini* Bernh.
23 *cuniculorum* Kr.
1 *curtula* Gze.
15 *diversa* J. Sahlb.
17 *fumata* Gr.
29 *grisea* Kr.
19 *haemoptera* Kr.
10 *inconspicua* Aubé
5 *intricata* Mnh.
21 *laevigata* Gyll.
11 *lanuginosa* Gr.
13 *lygaea* Kr.
20 *maculata* Bris.
18 *moerens* Gyll.
7 *moesta* Gr.
31 *obscurella* Gr.
12 *peeziana* Lohse
4 *puberula* Klug.
24 *ruficornis* Gr.
16 *sanguinea* L.
22 *spadicea* Er.
8 *sparsa* Heer
2 *spissicornis* Er.
9 *stichai* Likovsky
6 *tristis* Gr.
27 *verna* Say
14 *villosa* Mnh.

Norsk ent. Tidsskr. **15**, 105-110.

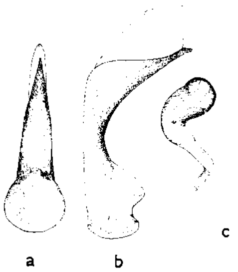


Anders Vik del.

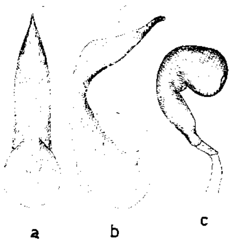
Fig. 1-31. Penis, Ventralansicht (a), Penis, Lateralansicht (b) und Samenkapsel (c) der nordischen Arten der Gattung *Aleochara*.



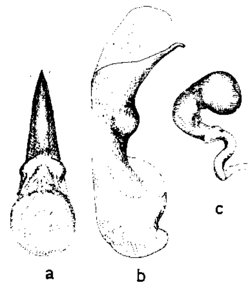
7 moesta



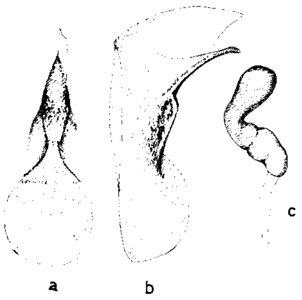
8 sparsa



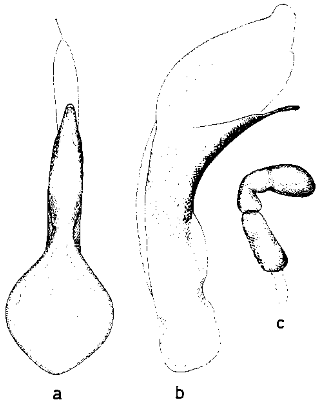
9 stichai



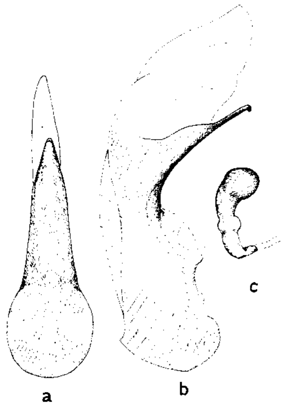
10 inconspicua



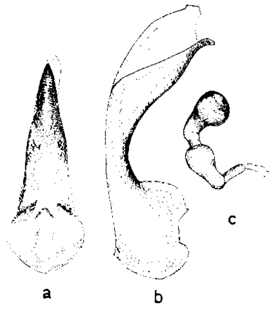
11 lanuginosa



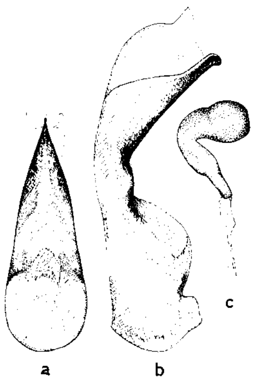
12 peeziana



13 lygaea



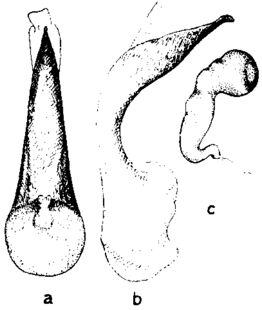
14 villosa



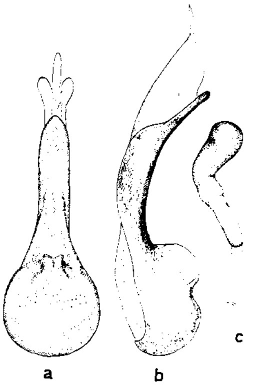
15 diversa

Anders Vik del.

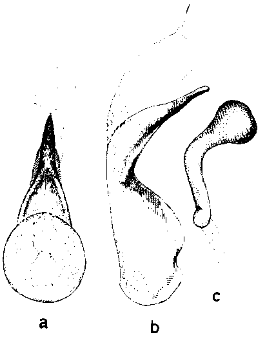
Fig. 1-31. Vortsetzung



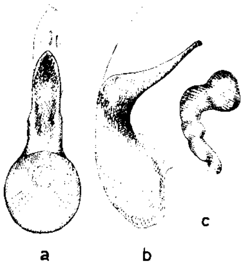
16 sanguinea



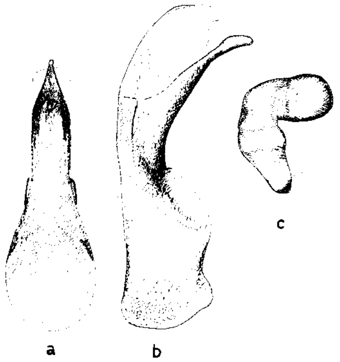
17 fumata



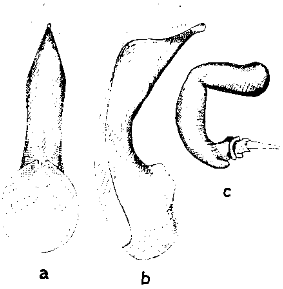
18 moerens



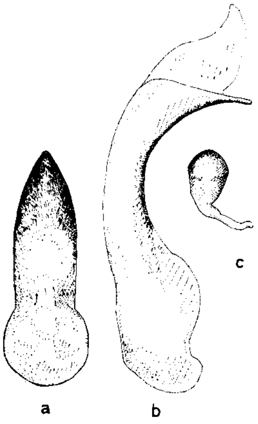
19 haemoptera



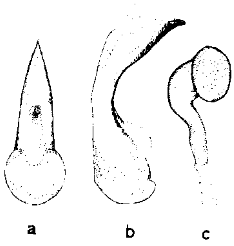
20 maculata



21 laevigata



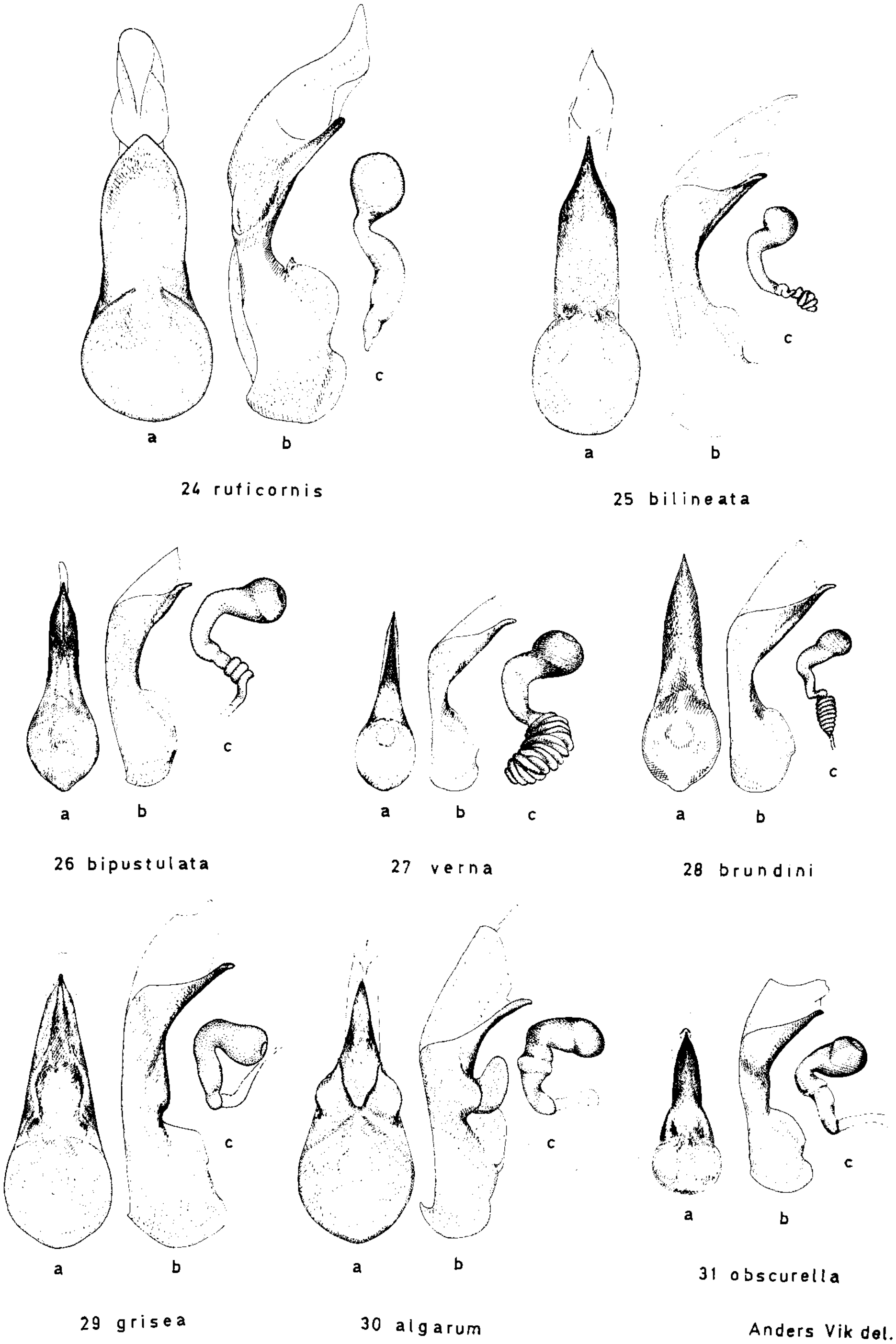
22 spadicea



23 cuniculorum

Anders Vik del.

Fig. 1-31. Vortsetzung



Anders Vik del.

Fig. 1-31. Vortsetzung

Für Hilfe mit Material und Auskünften sind wir folgenden Kollegen Dank schuldig: P. J. Brakman, Elsloo (L.), Holland G. Kerstens, Aldrup (Oldb.), Dr. Zbynek Likovsky, Praha, Dr. G. A. Lohse, Hamburg, Ingenieur A. v. Peez, Brixen, Italien und Kommerseråd Dr. Sten Stockmann, Helsingfors.

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Eingegangen 17 August 1968

Nasonovia vannesii n. sp. (Homoptera, Aphididae) on Ribes x cultorum

CHR. STENSETH
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Abstract: STENSETH, CHR. 1968. *Nasonovia vannesii* n. sp. (Homoptera, Aphididae) on Ribes x cultorum. *Norsk ent. Tidsskr.* **15**, 111-113.

Apterous and alate viviparous females, oviparae and male of a new aphid species, *Nasonovia vannesii* are described. The aphid lives on *Ribes x cultorum* and was found in Vadsø, Finnmark.

APTEROUS VIVIPAROUS FEMALE

Body oval, 3.0 mm long with entirely smooth pale tergum. Hairs on head, antennae, legs, and dorsal hairs on body faintly knobbed, ventral hairs more or less pointed. Frontal lateral tubercles well developed and divergent, smooth, the median tubercle prominent, 5/12 as high as the lateral ones, with two hairs. Antennae six-segmented, pale with apices of segment III, IV and V and the very basis of IV and V pale brown, segment VI pale brown. Antennal segments I-IV fairly smooth, V and VI with imbrications, segment III with 28/32 turberculated secondary rhinaria arranged on one side over its length. Length of antennal segments: III, 0.71; IV, 0.55; V, 0.49; VI, 0.17 + 1.06 mm. Hairs on antennal segment III maximally 0.029 mm and shorter than the basal articular diameter of the segment. Rostrum reaching to third coxae, apical segment (Fig. 1) 0.174 mm with 10 secondary hairs. Siphunculi 0.50 mm, cylindrical with expanded base, pale with dusky apices, dispersed but rather acutely imbricated, without annular incision below the flange. Cauda pale (Fig. 1) 0.333 mm long, with five hairs. Legs yellowish, first tarsal segment with 3, 3, 3 hairs, second tarsal segment of hind legs 0.127 mm long. Subgenital plate with 6 anterior and 13 posterior hairs. 8th abdominal tergit with 4 hairs. Hairs on 3rd and 8th tergite about equal in length, maximally 0.039 mm long.

Colour in life, dark green. Siphunculi pale green with dusky apices. Cauda pale green. Antennae pale with dusky marks as mentioned above.

ALATE VIVIPAROUS FEMALE

Body spindle-shaped, 2.76-3.16 mm long. Median frontal tubercle moderately developed. Antennae brown with the very base of segment III pale, ventral side of segment II, inner side of I and the pale basis of antennal segment III scabrous. Secondary rhinaria distributed: III, 47-54; IV, 18-30; V, 5-10. Antennal flagellum 1.0-1.2 × body length. Length of antennal segments: III, 0.76 0.84; IV, 0.46-0.63; V, 0.40-0.52; VI, 0.13-0.17 + 1.1-1.28 mm. Processus terminalis about 1.5-1.7 × antennal segment III. Hairs on antennal segment III maximally 0.018-0.029 mm, 0.6-0.8 × the basal articular diameter of that segment. Apical rostral segment 0.171-0.182 mm long, 1.3-1.6 × second segment of hind tarsi, with 10-11 secondary hairs. Siphunculi brown, 0.30-0.41 mm long, cylindrical with expanded base, 1.1-1.4 × cauda, apical $\frac{1}{3}$ with imbrication and basal $\frac{2}{3}$ with more or less transverse striae. Cauda elongate 0.276-0.310 mm long, acute, constricted in the middle part, with five

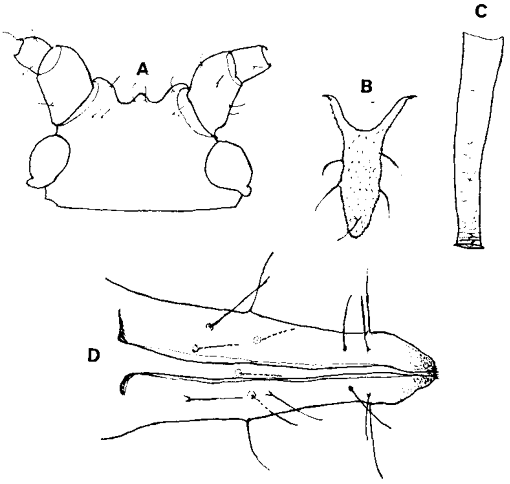

Fig. 1. *Nasonovia vannesii* n.sp.: Apt.viv. female; A, head; B, cauda; C, siphunculus; D, apical rostral segment.

hairs. Legs brown with basal part of femora and middle part of tibia brownish yellow. Subgenital plate with 4-9 anterior and 10-14 posterior hairs. 8th abdominal tergite with 4-(6) hairs, maximum hair-length 0.030-0.047 mm. Hairs on 3rd abd. tergite maximally 0.016-0.39 mm, 0.5-1.0 × articular diameter of antennal segment III. Abdominal sclerotisation as shown in Fig. 2, brown. Abdominal tergite 2-5 with small marginal tubercles.

Colour in life: antennae, head, thorax, and siphunculi black. Cauda smoky black. Abdomen green with sclerotic pattern black.

APTEROUS OVIPAROUS FEMALE

Body 1.92 mm long. Frontal lateral tubercles rather rectangular, median tubercle low. Antennal segment III with 9-15 secondary rhinaria. Length of antennal segments: III, 0.39; IV, 0.29; V, 0.31; VI, 0.11 + 0.63 mm. Apical rostral segment 0.143 mm long with 10 secondary hairs. Siphunculi 0.414 mm and cauda 0.230 mm long. Hind tibia with pseudosensoria. Second segment of hind tarsi 0.10 mm. 8 tergite with 9 hairs. Subgenital plate with 14 anterior and 27 posterior hairs. Other characters as in apterous viviparous female.

Colour in life yellow-green.

ALATE MALE

Body 2.3-2.5 mm long. Antennal flagellum 2.9-3.3 mm long. Length of antennal segments and distribution of secondary rhinariae as in al. viv. female. Apical rostral segment 0.156-1.66 mm long, 1.4 × second segment of hind tarsi. Cauda with seven hairs, and shorter than in al.viv. female.

Abdomen with marginal sclerites, ante- and postsiphuncular sclerites, not with a central sclerite. Tergite 1-8 with spinal sclerotic patches which sometimes are connected with intersegmental sclerites. Other characters as in alate viviparous female.

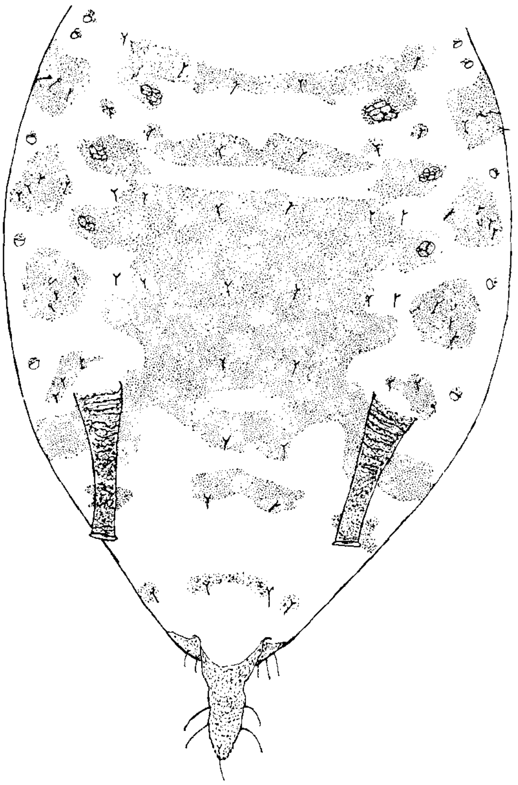

Fig. 2. *Nasonovia vannesii* n.sp.: Al. viv. female, dorsal view of abdomen.

BIOLOGY

The species described here was originally taken by Mr. G. Vannes on *Ribes x cultorum* at Vadsø, (N. latitude 70.1°), Finnmark, Norway, 8 VIII 1966. This sample consisted of alatae viviparae and alate males. The species was found again on the same plant and at the same locality on 27 VII 1967, the sample consisting of both apterous and alate viviparous females and alate males. Transferred to *R. x cultorum* in the insectary at Vollebekk, also oviparous females were produced.

These data indicate that *N. vannesii* can live on *Ribes x cultorum* during the whole year. On the other hand, the alate males do not exclude the possibility of facultative host alternation.

NOTES

Several species of *Nasonovia (Kakimia)* live on *Ribes* in America. Dr. Hille Ris Lambers has examined the material of *N. vannesii* and cannot find it to agree with any American species.

The apterous viviparous female of *N. vannesii* is distinguishable from European species of the genus by the lack of abdominal sclerotisation, combined with five caudal hairs, and the distribution of secondary rhinariae.

The alatae viviparae are in many respects like those of *N. dasyphylli* Stroyan and *N. saxifragae* Donc. and Stroyan, but both of these have a comparatively shorter second segment on the hind tarsus and shorter cauda, the latter also having a very much shorter processus terminalis.

HOLOTYPE

Apterous viviparous female, no. 313/67 C.S. Vadsø, Finnmark, 27 VII 1967 on *Ribes x cultorum,* leg. G. Vannes. In the collection of the Norwegian Plant Protection Institute, Div. of Entomology.

PARATYPES

Two alate viviparae. Data as for holotype. In the collection at Dr. Hille Ris Lambers, Bennekom, Netherlands.

Three alatae viviparae. Data as for holotype. Two alatae viviparae and 2 alatae males, no. 319/66 C. S. 8 VIII 1966, Vadsø, Finnmark on *Ribes x cultorum,* leg. G. Vannes. Apterous oviparous female, no. 334/67 C. S., on *Ribes x cultorum.* In the collection at the Norwegian Plant Protection Institute, Div. of Entomology.

ACKNOWLEDGEMENTS

I wish to thank Dr. Hille Ris Lambers, Bennekom, Netherlands, and H.L.G. Stroyan, Plant Pathology Laboratory, Harpenden, England for advice.

Received 15 September 1968

Sympherobius elegans STEPH. 1836 (Neuroptera, Planipennia) New to Norway

LITA GREVE
Zoological Museum, University of Bergen

Among several specimens of Neuroptera collected by stud. real. Arne Fjellberg at Tjøme, Vestfold, one specimen was identified as *Sympherobius elegans* STEPH. 1836, a species not earlier recorded in Norway. The exact locality was Kjære Tjøme, Vestfold, the date 26.6.1968 and the specimen, a female, was taken on pine *(Pinus silvestris)*. At the same time 5 specimens, two males and three females, of the related *S. fuscescens* were found.

S. elegans is found scattered all over Europe (Aspöck & Aspöck 1964), either single or just a few specimens found each time. While it is reported as common from places in southern Europe (Kis 1965), it is probably rare in Scandinavia. From Finland one specimen only is known (Meinander 1962), in Sweden the species is found as far north as Uppland (Tjeder 1940, 1953) and it is known from different parts of Denmark (Espen-Pettersen 1929), but there described as rare.

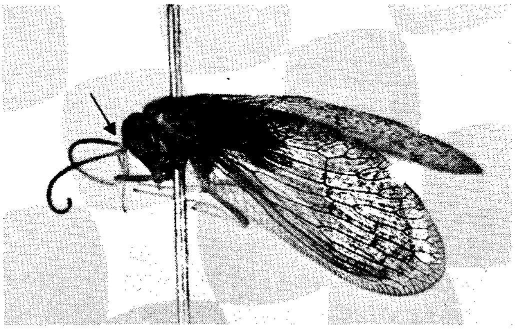

Fig. 1. *Sympherobius elegans* STEPH. The arrow indicates the two pale brown basal segments of the antennae.

S. elegans is found in deciduous woods and is mostly reported from oaks, beeches, hazels, and birches. Occasionally it is found on pines (Zeleny 1962).

ACKNOWLEDGEMENTS

I am indebted to stud.real. Arne Fjellberg for the kind loan and use of the specimen in his collection.

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Norsk. ent. Tidsskr. **15,** 114 1968.

The effect of inundation and choice of hibernation sites of Coleoptera living on river banks

JOHAN ANDERSEN
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Abstract: ANDERSEN, J. 1968. The effect of inundation and choice of hibernation sites of Coleoptera living on river banks. *Norsk ent. Tidsskr.* **15**, 115-133.
This investigation deals with the effect of inundation upon arthropods and, especially, Coleoptera living on river banks, and on their choice of hibernation sites. The water level in five rivers in central and Northern Norway was studied, and various collection methods were employed during inundation periods on two of the rivers (the Gaula in Sør-Trøndelag and Målselva in Troms). Observations of behaviour and experiments on tolerance to water were undertaken. The longest periods with inundations, caused by snow melting in the mountains, occur in May, June, and part of July, dependent upon the geographical position of the river and the height above sea level of the catchment areas. Despite an unusually long inundation period on the Gaula in 1965, the imaginal populations of Coleoptera seemed to be intact after the spring flood, and even larvae and pupae, and probably also eggs, survived the inundations. The arthropods have different ways of surviving the spring floods. On evenly sloping banks the epigeic arthropods move upwards, gradually, as the water level rises. If the spots are surrounded by more low-lying areas and are completely submerged, the arthropods living there are taken by the water. The survival time of some adult Coleoptera submerged in water was short, but as they soon tend to land among scum and twigs on trees and bushes, their chances of surviving are great. Eggs, pupae, most larvae, and some of all fossorial Coleoptera stages survive submerged in the river. Their chance of survival is probably less on coarse substratum (stone, gravel, coarse sand), than on fine material (fine sand, silt). Imagines of several species of *Bembidion*, *Dyschirius* spp., *Hydnobius* spp., *Bledius* spp., *Hypnoides* spp., *Morychus dovrensis Munst.*, and larvae of *Bembidion lunatum Dft.*, *Nebria gyllenhali Schnh.*, and several Staphylinidae at least partly hibernate on the river bank.

This paper deals with the effect of inundation upon the beetles living on river banks in central and northern Norway, and on their choice of hibernation sites.

Few such studies seem to have been carried out previously. The most thorough work has been done on the Rhine (Lehmann 1965), but the conditions there seem rather different from those on many rivers in Scandinavia. Some observations of the effect of flooding were undertaken in North America (Stickel 1948, Shelford 1954), in England (Joy 1910), and in Sweden on the river Klara (Wirén 1954).

In the present work the following rivers are taken into consideration: the Gaula in Sør-Trøndelag, the Namsen in Nord-Trøndelag, Saltdalselva in Nordland, Målselva in Troms, and the Tana in Finnmark. Field material elucidating the problems was collected on the Gaula and Målselva. The studies concentrate on the most characteristic species on the river bank. The positions of stations on the Gaula are given in Fig. 1.

METHODS

Records on the average water level of the rivers over periods up to 15 years were found in published and unpublished data from the Norwegian Waterways and Hydro-Electricity Board (Norges Vassdrags og Elektrisitetsvesen) for the following water gauging stations: Haga

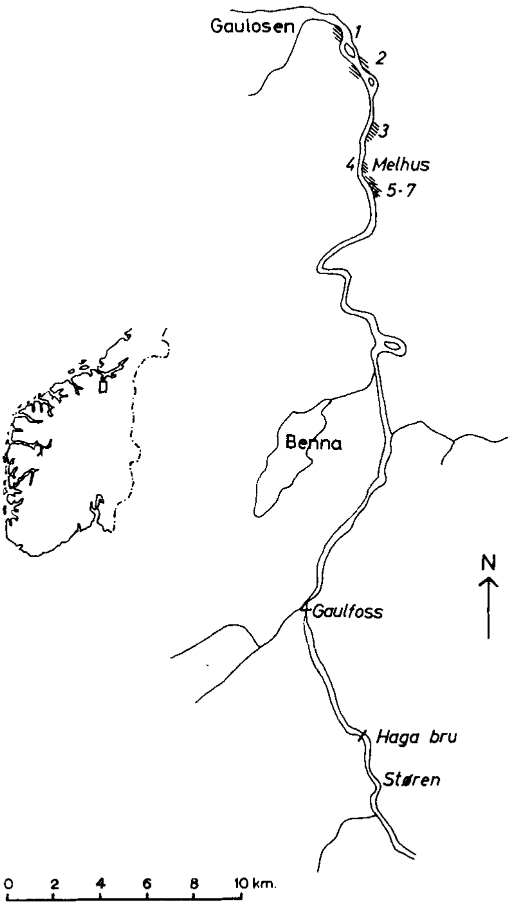

Fig. 1. Map of stations investigated on the Gaula.

bridge and Gaulfoss on the Gaula; Øvre Fiskemfoss on the Namsen; Junkerdal on Junkerdalselva (a tributary of Saltdalselva); Malangsfossen on Målselva; and Polmak on the Tana.

During the floods on the Gaula in 1965 and on Målselva in 1967, areas just above the water's edge were investigated by hand-collecting. In several samples the time spent on investigation was noted. In these cases the abundance could often be roughly estimated, as the time used to investigate one area unit of most habitats had been determined by noting the time used to collect in several areas of known size of each habitat. Despite its limitations, the method has been found to give quite reliable results for epigeic Carabidae (Andersen in preparation).

Sampling with quadrate frames is often less useful for studying the fauna on river banks (cf. Hefley 1937), and with the often limited time available to collect during flooding it was found impossible or impractical to use this method.

In submerged areas the silt was crushed and washed. The fine material floating in the river was skimmed off, partially dried, and afterwards sieved (these processes being done twice), and then one of the samples (III-2) was weighed. The absolute volumes of the samples were not measured, but Sample III-1 had a volume of about twice that of Sample III-2.

Investigations on hibernation were undertaken 18-21 October 1964 on the Gaula by sieving leaves and moss, pulling up grass, turning stones, scaling off bark at the foot of larger trees, and washing different types of soils in water. During the investigation at Rundhaug in October, collecting was done partly within areas whose size was approximately determined by means of a measure and sticks put into the earth. Metal frames were not used, as the earth was very uneven and bushes were in the way.

The ground was covered with 30-40 cm. of snow during the investigation at Rundhaug 10 October 1966, but the snow could be removed, exposing the unfrozen earth. At each of the habitats investigated in 1966 (G-1

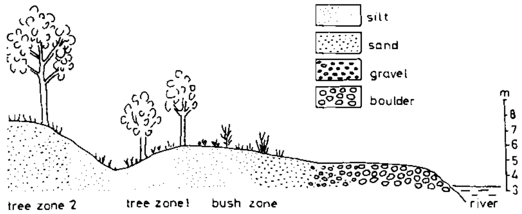

Fig. 2. Transverse section of the river plain on the Gaula. The water level measure at Gaulfoss water gauging station is marked on the right.

and H-1), the upper earth layer was gathered and washed in salt water; in 1967 the only sample washed (G-2) was washed in fresh water.

While epigeic as well as hypogeic beetles are taken when the material is washed, hand collecting yields mostly only the former. Larvae, as well as imagines, are taken when the material is washed in saltwater, whereas larvae are only partly taken in freshwater.

In 1966 the ground around Målselva was covered with snow, from late September. This had not happened in the whole period from 1947 to 1966, according to the Norwegian Meteorological Institute. Experiments are described in connection with the results.

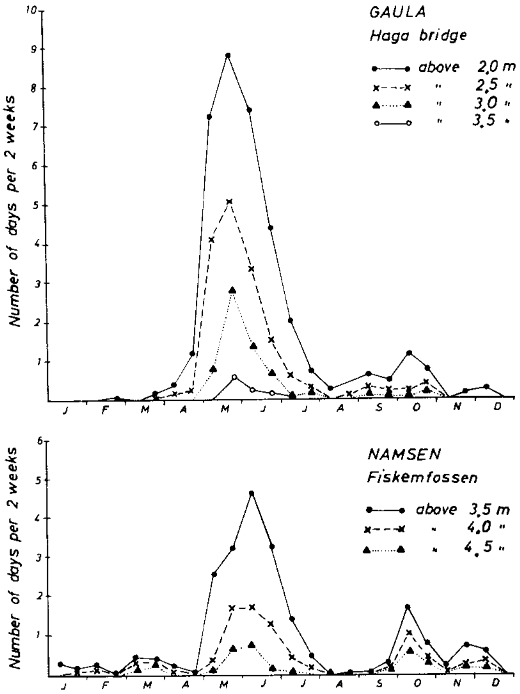

Fig. 3. Average number of days per two weeks per year the rivers Gaula and Namsen exceeded certain water level marks at the water gauging stations in the period 1946-1960.

THE FLOOD CONDITIONS IN THE RIVERS

Water levels below the lowest and above the highest water level marks given in Figs. 3 and 4 according to their abundances, were found to represent low or moderate, and very high water levels, respectively. Thus the selected marks probably give a fairly good picture of flood conditions in the rivers.

The relationships between the water levels at Gaulfoss (Table I), and the zones (Fig. 2) usually flooded in the areas investigated on the Gaula are as follows:

5 m: Gravelly, stony, and sandy areas, lowest lying parts of silty areas with bushes (bush zone) or trees (tree zone 1).

6 m: Parts of the bush zone and tree zone 1.

6.5 m: Greater parts of the bush zone and tree zone 1.

7.5 m: All the zones of the river bank and parts of high-level areas with woodland (tree zone 2, not regarded as belonging to the river bank).

In backwaters the lowest lying silty areas, partly with bushes, are flooded at a water level of about 4 m.

The Gaula most frequently floods in May and June and, above all, in late May (Fig. 3 and Table I). The spring flood on the Gaula had not commenced by the time of investigations in mid-May 1967. The gravelly and stony zones may be flooded for up to 35 days (1965), though usually between one and two weeks; greater parts of the bush zone for up to at least 11 days, but usually less than one week; and the uppermost sections of the river bank for up to three consecutive days (Table I). The year 1959 was exceptional, as no flooding occurred at all.

Besides the flood period in May-June, usually caused by snow melting in the mountains, large, but always transitory, inundations may occur in any month except in the period from December until the end of March, when the water level at the Haga bridge and Gaulfoss never exceeded 2.5 and 5 m, respectively. In November the water level only once exceeded 2.5 m at the Haga bridge.

Table I. *The dates of the longest periods each year (number of days in brackets) when the water level continuously surpassed the given water level marks at Gaulfoss. In 1966 observations are lacking between 23.5 and 31.5. Dates not available for 1962*

Year	Water level mark (m)				
	5.0	6.0	6.5	7.0	7.5
1958	25.5- 8.6 (15)	25.5- 4.6 (11)	25.5- 4.6 (11)	25.5-29.5 (5)	27.5-28.5 (2)
1959	(0)	(0)	(0)	(0)	(0)
1960	9.5-17.5 (9)	9.5-11.5 (3)	9.5-10.5 (2)	29.6 (1)	29.6 (1)
1961	2.5- 9.5 (8)	5.5- 8.5 (4) 1.6- 4.6 (4)	1.6-2.6 (2)	1.6- 2.6 (2)	1.6- 2.6 (2)
1963	9.5-15.5 (7)	9.5-12.5 (4)	10.5-12.5 (3)	11.5 (1)	11.5 (1)
1964	7.5-14.5 (8)	8.5-11.5 (4)	8.5- 9.5 (2)	31.8 (1)	31.8 (1)
1965	26.5-29.6 (35)	1.6-20.6 (20)	6.6-11.6 (6)	7.6-10.6 (4)	7.6- 9.6 (3)
1966	13.5-22.5 (10)	17.5-21.5 (5)	14.5-15.5 (2) 18.5-19.5 (2)	19.5 (1)	19.5 (1)

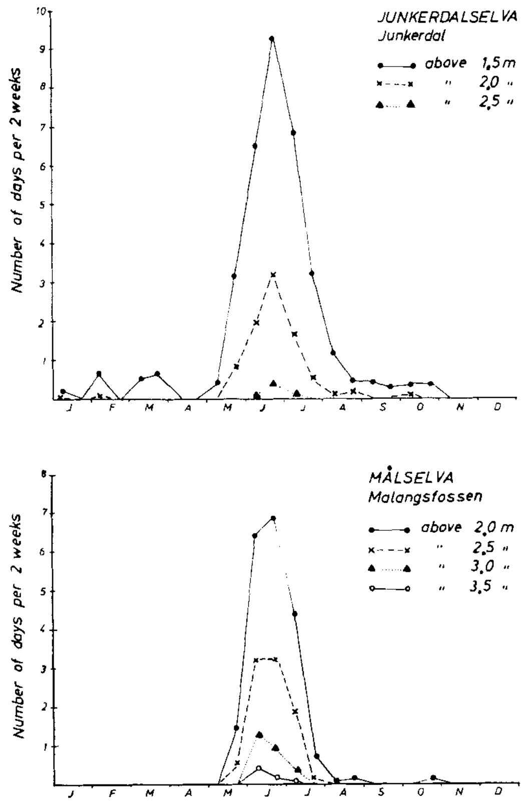

Fig. 4. Average number of days per two weeks per year the rivers Junkerdalselva and Målselva exceeded certain water level marks at the water gauging stations in the period 1946-1960.

At Fiskemfoss on the Namsen, the spring floods occur equally often in late May and June (Fig. 3). In autumn floods seldom occur on the Gaula, but are common on the Namsen. They are caused by high precipitation, as indicated by the monthly precipitation sums for Majavatn, near the catchment area of the river (The Norwegian Meteorological Institute). The period from December to March seems to be less stable on the Namsen than on the Gaula, as the water level in all the months exceeded 4 m, which is a rather high level, not very often surpassed even in spring.

Junkerdalselva and Målselva usually flood in June and the first part of July (Fig. 4). In Målselva the water level between September and the first part of May is nearly always rather low. At least the more elevated zones of the bank have probably never been flooded in this period, as the water level never surpassed 2.5 m and greater parts of the river bank at Rundhaug were observed to be exposed when the water level at Malangsfossen was 2.43 m. The spring flood on Målselva had not commenced by the collection time in late May 1967.

The Tana often floods as early as mid-May, and the inundations are usually over before mid-June.

Flooding is seldom accompanied by ice-drifting on the Gaula, the Namsen, Saltdalselva, and Målselva. This only happened on the Namsen on 3 March 1948 and 9 February 1960, and on the Gaula on 1 May 1966 (water level at Gaulfoss 6.7 m). Along these rivers the thaw in the lowland is usually complete before is has commenced in the mountains. On the Tana in Finnmark, drifting of ice usually occurs at the same time as the spring floods, because of simultaneous thawing over a wide range within the watercourse.

The temperature in the Gaula during the spring flood in 1965 was 7-8°C, in Målselva in June 1966 8-9°C, and on 2 June 1967 it was 6°C. These temperatures were measured in the rivers. In backwaters the temperature at Rundhaug, 2 June 1967, was higher, up to 12°C, but as the river rapidly rose the temperature decreased, and finally the temperature differences were negligible.

THE EFFECT OF INUNDATIONS

Investigation of fauna during and after inundations

I. Investigations during rising water level on Målselva (Rundhaug) 2-3 June and 22-23 June 1967

On both occasions, the river rose rapidly from a moderate to a high level during the night. The surface layer of the zones up to 1 m above the water's edge was investigated.

Sample I-1 (Table II), 2 June 1967: Sandy places without vegetation. Lower lying sandy places submerged.

Samples I-2 (Table II), 2 June (I-2, A) and 22 June 1967 (I-2, B and C): Gravelly slopes without vegetation, mostly elevated.

Samples 1-3 (Table II), 2 June (1-3, A) and 22 June 1967 (I-3, B): Strongly sloping, gravelly declivity, ending above in a dense grassy mat. Most of the lower lying gravelly sites submerged. None of the species listed in the table were taken from the same sites at low water level.

Table II. *Coleoptera collected in Samples I 1-3 by time-catch. The figures give the number of specimens; if estimated, the abundance per m² is given in brackets*

Sample Collecting time (mins.)	I–1 15	I–2, A 26	I–2, B 20	I–2, C 14	I–3, A 40	I–3, B 20
Dyschirius septentrionum Munst.	1	1 (0.3)	–	–	–	–
Bembidion difficile Mtsch.	–	–	–	–	1 (0.2)	–
B. lapponicum Zett.	2	2 (0.6)	1 (0.4)	1 (0.5)	2 (0.4)	1 (0.4)
B. petrosum Gebl.	1	25 (7.2)	21 (7.9)	10 (5.4)	83 (15.6)	18 (6.8)
B. prasinum Dft.	–	1 (0.3)	–	2 (1.2)	3 (0.6)	2 (0.8)
B. schueppeli Dej.	–	5 (1.5)	1 (0.4)	–	–	–
B. virens Gyll.	–	–	–	–	1 (0.2)	–
Agonum fuliginosum Panz.	–	–	–	–	–	1 (0.4)
Geodromicus plagiatus F.	–	–	–	–	–	2 (0.8)
Stenus fuscipes Gr.	–	–	–	–	–	1 (0.4)
S. strandi Bck.	–	–	–	–	2 (0.4)	–
Oxypoda procerula Mnh.	–	–	–	–	1 (0.2)	–
Hypnoidus pulchellus L.	2	–	–	–	–	–
H. rivularius Gyll.	–	–	–	–	2 (0.4)	–

Table III. *Coleoptera collected in Samples I–4–5 by time-catch. The figures give the number of specimens; if estimated, the abundance per m² is given in brackets*

Sample Collecting time (mins.)	I–4, A 30	I–4, B 20	I–4, C 12	I–5, A 85	I–5, B 20
Pelophila borealis Payk.	–	–	–	6 (1.6)	–
Notiophilus sp. (larva)	–	–	–	1 (0.3)	–
N. aquaticus L.	–	–	–	–	1 (1.1)
Elaphrus riparius L.	5	–	–	2 (0.5)	–
Lorocera pilicornis F.	–	–	–	1 (0.3)	–
Clivina fossor L.	2	–	–	–	–
Dyschirius septentrionum Munst.	4	1	–	2 (0.5)	1 (1.1)
Bembidion bipunctatum L.	–	1	–	2 (0.5)	–
B. difficile Mtsch.	–	–	–	35 (9.2)	–
B. lapponicum Zett.	–	1	–	–	–
B. petrosum Gebl.	–	16	4	5 (1.3)	–
B. prasinum Dft.	–	2	–	–	–
B. schueppeli Dej.	–	–	10	19 (5.0)	24 (26.7)
Amara quenseli Schnh.	–	–	–	–	1 (1.1)
A. quenseli (larvae)	–	2	–	–	–
A. torrida Ill.	–	–	–	–	1 (1.1)
Pterostichus nigrita F.	–	–	–	1 (0.3)	–
Agonum fuliginosum Panz.	–	–	–	2 (0.5)	–
Phosphuga atrata L.	1	–	–	–	–
Bledius litoralis Heer.	–	–	–	1 (0.3)	–
Stenus bimaculatus Gyll.	–	–	–	–	1 (1.1)
S. carbonarius Gyll.	–	–	–	2 (0.5)	–
S. clavicornis Scop.	–	–	–	1 (0.3)	–
S. fuscipes Gr.	–	–	–	–	3 (3.3)
S. strandi Bck.	1	–	–	9 (2.4)	6 (6.7)
Tachinus rufipes DeG.	–	–	–	2 (0.5)	–
Atheta sp.	1	–	–	–	–
A. fungi Gr.	1	–	–	1 (0.3)	2 (2.2)
A. graminicola Gr.	–	–	–	2 (0.5)	–
A. orbata Er.	1	–	–	–	–
Oxypoda procerula Mnh.	–	–	–	1 (0.3)	1 (1.1)
Dasyglossa prospera Er.	3	–	–	–	–
Hypnoidus pulchellus L.	3	1	–	–	–
H. riparius F.	–	–	–	2 (0.5)	–
H. rivularius Gyll.	–	–	–	1 (0.3)	–
Aegialia sabuleti Panz.	1	–	–	–	–
Otiorrhynchus dubius Strøm	1	–	–	–	–

Samples I-4 (Table III), 22 June 1967: Elevated, usually dry, silty-fine sandy sites with more or less well developed vegetation. All the lower lying silty places with sparse vegetation submerged. Samples taken at different places and water levels: I-4, A at a moderately high water level, the other two at very high water levels.

Samples I-5 (Table III), 2 June (I-5, A) and 22 June 1967 (I-5, B): Silty areas with dense vegetation, partly in woodland. Rather elevated, but not so much as the above localities.

II. Investigation of the surface after the culmination of a flood on the Gaula.

Mostly only Carabid beetles were collected.

Samples II-1 (Table IV), Station 3, 10 June (II-1, A) and Station 7, 12 June 1965 (II-1, B): In tree zone 2, the flood had deposited large amounts of twigs and leaves, among which the Coleoptera were found. Silt mixed with humus —normally loose and porous, but compact by the time of the investigation. The site on Station 7 was also investigated 23 June, but Carabidae were not found.

Samples II-2 (Table IV), Stations 6 and 7, 12 June 1965: Rather elevated, more or less sunny spots with fine sand-silt mixture and little or no vegetation. Sample II-2, A, from above bare, sandy and gravelly places, the sample on Station 7 from just above open, silty places in the bush zone.

Sample II-3 (Table IV), Station 1, 14 June 1965: The water level had dropped considerably and small refuges (some square metres), surrounded by the river, appeared in the bush zone. The sand was saturated with water.

III. Material collected in the river or from trees or trunks isolated in the river

Sample III-1 (Table V), the Gaula, Station 3, 14 June 1965: The material had been in the river for nine days or more. The volume of the material about twice that of sample III-2.

Sample III-2 (Table VI), Rundhaug, 2 June 1967: The material had been in the river for only a few hours. Weight of dried and sieved material 50 g. The only arthropods occurring numerously were Collembola.

The material which had been in the river for days was much richer than that which had

Table IV. *Number of specimens of Coleoptera collected in Samples II-1-3 by time-catch*

Sample Collecting time (mins.)	II–1, A 40	II–1, B 40	II–2, A 15	II–2, B –	II–3 –
Nebria gyllenhali Schnh.	–	3	–	–	–
Dyschirius angustatus Ahr.	–	–	–	–	1
Asaphidion pallipes Dft.	1	–	–	–	–
Bembidion argenteolum Ahr.	–	–	1	–	–
B. bruxellense Wesm.	–	3	4	–	–
B. femoratum Sturm	–	–	–	–	1
B. lapponicum Zett.	–	–	4	–	–
B. litorale Ol.	–	–	–	3	2
B. lunatum Dft.	–	–	–	7	2
B. petrosum Gebl.	2	–	13	7	1
B. quadrimaculatum L.	–	1	–	–	–
B. saxatile Gyll.	–	–	1	–	1
B. schueppeli Dej.	13	41	–	–	23
B. semipunctatum Don.	–	–	–	4	13
B. virens Gyll.	–	–	–	–	1
Trechus secalis Payk.	–	2	–	–	–
Calathus melanocephalus L.	1	–	–	–	–
Agonum assimile Payk.	–	2	–	–	–
A. micans Nic.	–	1	–	–	–
Ancyrophorus omalinus Gyll.	–	–	–	–	1
Brachyusa concolor Er.	–	–	–	–	1
Tachyusa leucopus Mrsh.	–	–	–	–	1
Psammodius asper Fabr.	–	–	–	2	–

Table V.
Number of Coleoptera collected in Sample III-1

Carabidae	
Notiophilus biguttatus F.	2
Elaphrus riparius L.	1
Clivina fossor L.	28
Dyschirius angustatus Ahr.	8
D. globosus Hbst.	1
D. septentrionum Munst.	3
Bembidion bruxellense Wesm.	3
B. femoratum Sturm.	1
B. lunatum Dft. (larva)	1
B. nitidulum Mrsh.	1
B. petrosum Gebl.	1
B. prasinum Dft.	2
B. schueppeli Dej.	6
B. virens Gyll.	1
Patrobus atrorufus Strøm	1
Trichocellus cognatus Gyll.	1
Amara apricaria Payk.	1
Calathus melanocephalus L.	1
Agonum assimile Payk.	1
Dytiscidae	
Hydroporus planus F.	1
H. tristis Payk.	1
Agabus arcticus Payk.	1
A. guttatus Payk.	2
Hydrophilidae	
Hydraena britteni Joy.	3
Limnebius truncatulus Th.	1
Helophorus strigifrons Th.	1
Sphaeridium scarabaeoides L.	1
Cercyon analis Payk.	1
Anacaena globulus Payk.	2
Clambidae	
Clambus armadillo DeG.	1
C. minutus Sturm.	1
Ptiliidae	
Ptenidium punctatum Gyll.	1
P. pusillum Gyll.	2
Acrotrichis sp.	2
Staphylinidae	
Larvae (indet.)	2
Lathrimaeum atrocephalum Gyll.	1
Olophrum assimile Gyll.	4
Arpedium quadrum Gr.	3
Lesteva monticola Kies.	1
Geodromicus plagiatus F.	3
Ancyrophorus omalinus Er.	22
Thinobius munsteri Scheerp.	1
T. strandi Smet.	1
Trogophloeus elongatulus Er.	2
Oxytelus rugosus F.	13
Bledius sp. (larva)	1
B. arcticus J. Sahlb.	1
B. denticollis Fauv.	6
B. erraticus Er.	34
B. litoralis Heer	2
B. longulus Er.	37
Stenus biguttatus L.	2
S. clavicornis Scop.	3
Xantholinus clairei Coiff.	1
X. angustatus Steph.	1
Gabrius sp.	1
Philonthus subnigritulus Reitt.	1
Quedius (*subgenus Raphirus*) Sp.	1
Q. pseudolimbatus A. Str.	2
Tachyporus abdominalis F.	1
Tachinus corticinus Gr.	4
T. laticollis Gr.	1
T. rufipes DeG.	3
Gyrophaena fasciata Mrsh.	1
Tachyusa leucopus Mrsh.	2
Sipalia circellaris Gr.	4
Amischa sp.	1
Atheta sp.	1
A. britteni Joy.	1
A. currax Kr.	1
A. debilis Joy.	2
A. eichhoffi Scriba	2
A. elongatula Gr.	13
A. fungi Gr.	7
A. graminicola Gr.	1
A. hygrobia Th.	6
A. hygrotopora Kr.	2
A. hypnorum Kies.	2
A. insecta Th.	13
A. melanocera Th.	5
A. oblongiuscula Sharp	1
A. orbata Er.	3
A. silvicola Kr.	4
A. subtilissima Kr.	1
A. sulcifrons Steph.	6
Elateridae	
Hypnoidus consobrinus Muls., Guill.	2
H. dermestoides Hbst.	16

H. pulchellus L.	4
H. riparius F.	3
H. rivularius Gyll.	1
Athous subfuscus Müll.	1
Byrrhidae	
Simplocaria semistriata F.	3
Cytilus sericeus Forst.	1
Syncalypta paleata Er.	2
Cryptophagidae	
Paramecosoma melanocephalum Hbst.	1
Atomaria fuscicollis Mnh.	6
A. puncticollis Th.	2
Coccinellidae	
Adalia bipunctata L.	1
Calvia 14-guttata L.	1
Pythidae	
Rhinosimus ruficollis L.	2
Scarabaeidae	
Psammodius asper F.	1
Aegialia sabuleti Panz.	2
Chrysomelidae	
Syneta betulae F.	1
Phytodecta pallidus L.	1
Phyllodecta vitellinae L.	1
Curculionidae	
Apion loti Kby.	2
Otiorrhynchus dubius Strøm	1
O. ovatus L.	1
Sitona flavescens Mrsh.	1
Tropiphorus obtusus Bonsd.	1
Notaris acridulus L.	10
Grypus equiseti F.	1
Phytobius velaris Gyll.	2
Rhynchaenus foliorum Müll.	11
Scolytidae	
Hylastes cunicularius Er.	1
Dryocoetes alni Georg.	1
D. autographus Ratz.	1

been in the river for hours. Collected material from the Gaula 4 August 1961 (partly published in Andersen 1962), gave the impression of a fauna even richer than that in June 1965, quantitatively as well as qualitatively. This material had been in the river for less than one day.

IV. Sites with compact silt submerged by the river

Sample IV-1 (Table VII), the Gaula, Station 6, 12 June 1965: Sparse vegetation. The sites had been submerged at least seven, perhaps twelve, days and nights.

Sample IV-2 (Table VII), Rundhaug, 22 June 1967: Sparse vegetation. The sites had been submerged a few hours. The silt was crushed and washed within an area of about 2-4 m^2.

Sample IV-3, Rundhaug, 22 June 1967: Dense vegetation. The sites had been submerged a few hours. No Coleoptera were found by crushing the silt. Earlier in the day, before the sites were flooded, they harboured a rich fauna (Samples I-5).

Observations and experiments

When jars, containing adult Coleoptera living in their natural substratum, were carefully filled with water at 18-20° C, the fol-

Table VI.

Number of Coleoptera collected in Sample III–2

Bembidion schueppeli Dej.	1
Notiophilus sp. (larva)	1
Arpedium brachypterum Gr.	1
Bledius arcticus J. Sahlb.	1
Gyrophaena nana Payk.	1
Sipalia circellaris Gr.	3
Atheta magniceps J. Sahlb.	1
A. melanocera Th.	2
A. microptera Th.	1
Hypnoidus pulchellus L.	5
Cytilus cericeus Forst.	1
Aegialia sabuleti Panz.	3
Hylastes brunneus Er.	1

Table VII.
Number of Coleoptera collected in Samples IV-1-2

	Sample	
	IV-1	IV-2
Clivina fossor L.	1	–
Bledius arcticus J. Sahlb.	–	3
B. denticollis Fauv.	–	10
B. erraticus Er.	–	1
B. longulus Er.	3	–
Psammodius asper Fabr.	13	–

lowing species were seen on the surface within one hour (number of specimens in brackets): *Bembidion argenteolum* Ahr. (18), *B. petrosum* Gebl. (37), *B. schueppeli* Dej. (50), *B. semipunctatum* Don. (40), *B. velox* L. (32), whereas *Psammodius asper* Fabr. (10) and 2 of 10 *Bledius longulus* Er. remained in the silty substratum, but the latter were dead when the glasses were examined after seven days. None of 30 specimens of *Bledius erraticus* Er. remained in sandy substratum. *Bembidion argenteolum, B. velox, Bledius longulus, B. erraticus* and *Psammodius asper* had previously dug down into their natural substratum, whereas the other *Bembidion* spp. had sheltered in crevices or under small stones or were running about. Field studies support these laboratory observations as non-digging species *(Bembidion* spp., *Stenus* spp., *Atheta* spp., *Tachyusa* spp., and others) ran away, whereas *Bledius* spp. partly remained in the earth when water was poured over it.

When jars containing larvae of *Bembidion argenteolum, B. litorale* Ol., *B. lunatum* Dft., *B. petrosum, B. velox, B. virens* Gyll., *Nebria gyllenhali* Schnh., and several Staphylinidae, were carefully filled with water, the larvae usually remained in the substratum if they had burrowed in, but floated if they were on the surface—obviously because of air-bubbles sticking to the body. When repeatedly pulled below the surface, the bubbles were mostly lost and the larvae sank, whereas a Cantharidae larva, with its dense pubescence, still floated. Eggs do not float in water.

Swimming capacity was studied by throwing some arthropods into nearly calm water 1-2 m from a bank. The following species were able to get to the bank under their own power in a water temperature between 11.5 and 15.0° C: *Elaphrus riparius* L., *E. cupreus* Dft., *Dyschirius angustatus* Ahr., *D. septentrionum* Munst., *Bembidion petrosum, B. litorale, B. schueppeli, B. saxatile* Gyll., *B. virens, Amara interstitialis* Dej., *Calathus erratus* Sahlb., *Agonum assimile* Payk., *A. gracile* Gyll., *A. muelleri* Hbst., *Stenus strandi* Bck., *Xantholinus fracticornis* Müll., *Philonthus subvirescens* Th., *Atheta sulcifrons* Steph., *Chilopora rubicunda* Er., and the spider, *Lycosa agricola* Th.

Agonum assimile, Bembidion petrosum and *Lycosa agricola* swam very rapidly; whereas *Dyschirius spp., Bembidion schueppeli, Xantholinus fracticornis, Atheta sulcifrons,* and *Chilopora rubicunda* were most sluggish. The swimming capacity of *Pelophila borealis* Payk., *Bembidion petrosum, B. schueppeli,* and *Stenus strandi* were also studied at a temperature of 6-8° C and all were able to swim to the bank. All specimens swam to the nearest bank, and never out towards the middle of the river.

Further studies were made during sunny weather at Rundhaug 28 May 1967 between 1600 and 1900 hr. and 29 May between 1000 and 1100 hr. The animals were collected on the South bank of the river, except *Amara interstitialis,* which was taken in a meadow several kilometres from the river. When *Elaphrus riparius* (7 specimens), *Bembidion petrosum* (20), *B. schueppeli* (5), *Amara interstitialis* (3), *Agonum gracile* (1), *Stenus strandi* (1), and *Lycosa agricola* (3) were thrown 1 m out into a pool of 20 m length and 10 m breadth, situated on a treeless river bank, the animals usually swam towards the nearest bank, irrespective of the compass direction.

Experiments with *Elaphrus riparius* and *Bembidion petrosum* in a 10-20 m wide pool on the Gaula June 1968 showed that the animals swam towards the observer, irrespective of whether he was on the bank or in the water. If the observer was sufficiently far away, the animals orientated irrespective of his position, and swam to the nearest bank.

Bledius spp. *Psammodius asper, Aegialia sabuleti* Panz., *Notaris acridulus* L., and *Phyllodecta* sp. were helpless in water, nearly or completely incapable of swimming even at a temperature of up to 20° C.

Specimens of *Bembidion petrosum* and *B. lapponicum* were able to fly directly from the surface of warm water (above 25° C).

The ability of some Carabidae to remain alive and floating on a calm water surface was studied in the laboratory at 6-8° C and at 18-20° C (Table VIII and Fig. 5), by putting specimens in Erlenmeyer retorts with water. At first the beetles swam about, but later mostly rested. However, they were usually movable until they sank naturally, or when they were pushed under water. Specimens of *Bembidion petrosum* were able to elevate their bodies above the surface of the water for days.

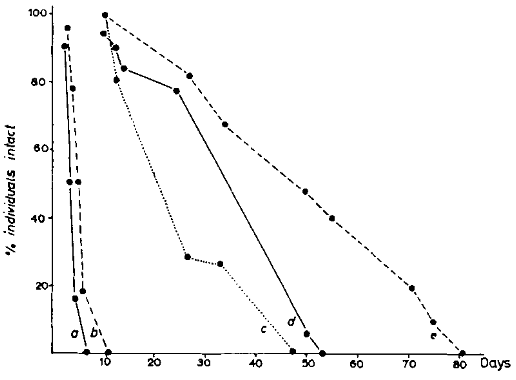

Fig. 5. Ability of *Bembidion* spp. to remain floating and movable on a calm water surface at two different temperatures.

a: *B. schueppeli* (n = 35) at 18-20 °C
b: *B. petrosum* (n = 22) at 18-20 °C
c: *B. lapponicum* (n = 25) at 6-8 °C
d: *B. schueppeli* (n = 30) at 6-8 °C
e: *B. petrosum* (n = 30) at 6-8 °C

Further data about *B. petrosum* and *B. schueppeli* at 18-20 °C are given in Table VIII.

Table VIII. *Number of days some Coleoptera were in motion and able to float on a calm water surface at 18-20 °C*

Species	n	M	95% confidence limits for M	range
Bembidion litorale Ol.	5	7.0 ± 2.3		4-9
B. petrosum Gebl.	22	6.1 ± 0.9		3-10
B. schueppeli Dej.	35	4.5 ± 0.4		2-6
Patrobus astrorufus Strøm	8	5.4 ± 4.6		1-14
Pterostichus niger Schall.	12	3.2 ± 1.9		1-8
Agonum assimile Payk.	17	8.7 ± 2.1		3-14
Bledius arcticus J. Sahlb.	21	5.5 ± 1.5		1-8

n: number of specimens; M: mean number of days

The beetles take up water, their abdomens being very swollen when they sink. If, after having sunk, the beetles are taken up at once they often revive in air, but none were alive after 2-3 days submergence. *Bembidion petrosum* tried in vain to fly from the water surface at 18-20° C. At 18-20° C one female each of *Pterostichus niger, Patrobus atrorufus,* and *Bembidion petrosum,* and several *B. schueppeli* and *Agonum assimile,* deposited eggs. *Agonum assimile* laid some after only four hours, and numerous eggs after six hours. After six days in water many eggs had hatched, and at least one larva was alive. No beetles laid eggs at 6-8° C even though dissections after death revealed that several had mature ovaries.

The survival time of the beetles is extremely dependent upon the temperature, *Bembidion schueppeli* and *B. petrosum* living much longer at 6-8° C than at 18-20° C (Fig. 5). At least *B. petrosum* lived so long that death sometimes may have had other causes than the effects of water, for instance hunger or old age. *Bembidion petrosum* lived longer than *B. schueppeli, B. lapponicum,* and *Pterostichus niger,* whereas there was no significant difference between the survival time of the first mentioned and *Agonum assimile,* nor between *Bembidion schueppeli* and *Pterostichus niger.*

Some Coleoptera (Table IX) were completely submerged in water-filled glasses at 6-8° C. The glasses containing the adults were covered with gauze lids, and then submerged in a jar. After the submergence period, which was varied, the beetles were allowed to live on a moderately moistened substratum, in order to observe whether they survived or not. During the submergence, the imagines nearly always sank to the bottom after one or two days, usually after only a few hours, and were quite immobile. Only two specimens of *Bembidion schueppeli* remained suspended in the water between two and six days. When the experiment was of short duration (one day), the imagines which had sunk completely retained their mobility after a while in air, and seemed undamaged, but many beetles died after four days' submergence. No females laid eggs.

The larvae seem to tolerate submergence better than the imagines. The larvae are often mobile for days, and survive fairly long periods submerged. Even after being submerged 14 days, one larva of *Bembidion*

Table IX. *Survival rate of some beetles during complete submergence at 6-8°C*

		Experiment nr. and days (in brackets) of exposure																	
		1			2			3			4			5			6		
		(1)			(2-4)			(5-7)			(8-10)			(14-16)			(22)		
Species	n	+	±	−	+	±	−	+	±	−	+	±	−	+	±	−	+	±	−
Imagines																			
Bembidion petrosum Gebl.	49	10	0	0	6	0	4	4	0	25									
B. schueppeli Dej.	45	10	0	0	4	0	6	0	0	25									
Bledius denticollis Fauv.	10										1	0	9						
B. erraticus Er. ssp. *bosnicus* Bernh.	48				8	0	12	6	0	9	0	0	13						
Stenus bimaculatus Gyll.	3				0	0	3												
S. strandi Bck.	4				4	0	0												
Philonthus subvirescens Th.	14							2	0	12									
Quedius fellmanni Zett.	4				1	0	3												
Atheta spp.	12				0	0	12												
Chilopora rubicunda Er.	5				0	0	5												
Oxypoda islandica Kr.	6				0	0	6												
Larvae																			
Nebria gyllenhali Schn. (3rd stage)	19				4	10	0	3	0	0				1	1	0			
Asaphidion pallipes Dft. (3rd stage)	1							1	0	0									
Bembidion sp.	2										2	0	0						
B. argenteolum Ahr. (1st stage)	32										4	8	20						
B. litorale Ol. (3rd stage)	1										1	0	0						
B. lunatum Dft. (3rd stage)	3							1	0	0				2	0	0			
B. virens Gyll. (1st-3rd stage)	10							8	0	1	1	0	0						
Patrobus septentrionis Dej. (3rd stage)	1																0	1	0

+: number of specimens alive after the submergence; −: number of specimens dead after the submergence; ±: number of specimens alive after the submergence, but died some days later; n: Total number of specimens *lunatum* pupated and the fact that the imago did not emerge and that the larva of *Patrobus septentrionis* and several larvae of *Bembidion argenteolum* died after some time may well have other causes than submergence, since a high death rate for larvae (especially first stage) and pupae is observed in captivity under normal conditions.

DISCUSSION

The insect fauna at the spring flood should be poor quantitatively as well as qualitatively, only comprised of the imaginal hibernators surviving the winter (Wirén 1954). However, many *Bembidion* spp. on the Gaula were abundant prior to the spring floods in late May 1965, in mid-May 1967 and on Målselva in 1967 at the end of May (Andersen in prep.). Other typical bank-living beetles *(Dyschirius* spp., *Bledius* spp., *Tachyusa* spp., *Stenus* spp., and *Atheta* spp.) were present, too. Thus on the Gaula, Målselva, and other rivers of similar type, the adults of many or most beetles are exposed to the spring floods. The number of dead insects should greatly surpass the number of living ones in the cold water during spring floods (Wirén 1954). The author states that the insects are in a cold stupor with little ability to save themselves. Only in high air temperatures should some arthropods survive, by slowly climbing objects floating upon the river. A large death-rate during floods is also supposed by Joy (1910). This is not supported by the present studies on the Gaula and Målselva, as the imaginal populations of most of the *Bembidion* species seemed intact even after the long spring flood period on the Gaula in 1965 (Andersen in prep.). The same also seemed to be the case for most other arthropods confined to river banks. The methods making it possible for Coleoptera to survive during inundations are discussed in the following.

Generally, the obligatory shore- and bank-living species do not seem to differ from other ground-living beetles, either in ability to survive on a calm water surface, or in swimming capacity. Thus *Agonum assimile* survived at least as long as *Bledius* sp. and any *Bembidion* spp. The first is not restricted to shores and banks, whereas this is the case for the species of the two latter genera used in the experiment. Furthermore *Bembidion schueppeli,* confined to shores and banks, lived insignificantly longer than *Pterostichus niger,* living in woodland and fields.

Joy (1910) studied the locomotion method of various Coleoptera. *Dianous coerulescens* Gyll., *Stenus* spp., and *Anchomenus albipes* Fabr. (= *Agonum ruficorne* Gze.) are able to 'skim' rapidly over the water surface by reducing the tension of the surface membrane behind them, using a substance secreted from the abdomen. Otherwise Coleoptera are swimmers, but some rather poor (mostly Staphylinidae). According to the same author (Joy 1910), small species are much affected by capillary attraction. However, it seems obvious that the morphology, above all else, determines the swimming capacity of the species. Species with a plump body and short legs, for example Chrysomelid, Curculionid, and Scarabaeid beetles, or with a very long body and short legs as several Staphylinidae, for instance *Bledius* spp., are at best very poor swimmers, in contrast to the typical runners with an elongate body and long legs, e.g. many Carabidae and Staphylinidae. Species of both these groups are richly represented among the fauna on shores and banks, as well as in other habitats.

According to Palm & Lindroth (1936), Wirén (1954) and Lehmann (1965), shore-living species are able to orientate straight to the nearest bank. In a way this is evident also from the present experiments, and even for those without any connection to water. However, when the observer is close to the animals they orientate without regard to the bank, towards the observer. Further studies are needed to analyse the orientation mechanism, but the present observations indicate that the species studied, as with *Stenus* spp.

(Jenkins 1960), orientate towards objects giving the largest contrast and the highest elevation angle. On river banks of the same type as those investigated in the present study, this orientation mechanism probably has greater survival value than the astronomical orientation present among *Arctosa perita* (Latr.) and some Carabidae *(Omophron limbatum* Fbr., *Scarites terricola* Bon.) living on river banks (Papi 1955 a and b). A high elevation angle is a good indication that the place or object aimed at is near (Jenkins 1960); the animals using an astronomical orientation may swim the longest distance—out into the river—if they have been forced from the bank where they usually live to the opposite one.

Sample IV-3, and several of the present experiments and observations, as well as experiments of Lehmann (1965), indicate that when submerged, most non-digging Carabidae and Staphylinidae float and try to get to land. Although the abundance of insects on flotsam collected from the river is dependent upon the time the flotsam has been in the water (Strand 1938), other factors are also important. On an evenly sloping bank epigeic arthropods usually avoid the flood or are able to swim to the nearest bank, if the current velocity is low. Thus flotsam collected in the river at Rundhaug in June 1967, except for Collembola only, contained a few insects (Sample III-2, Table VI), whereas the slopes above the rising river had a rather rich fauna (Samples I-1-5, Tables II and III). *Bembidion difficile* and *B. petrosum* seemed to be more numerous than at low water levels (Andersen in prep.). The insects in samples II-2 (Table IV) may have avoided the flood in the same manner.

Localities are often surrounded by more low-lying ground. Here the connection to land is cut by the floods, and the animals are taken by the water, if they do not fly away, when the whole site is submerged.

Lehmann (1965) states that macropterous ground beetles may fly away from the bank during inundation. If this is the case in the areas studied here, they must have flown far away, because specimens of most of the macropterous species were absent in the wood and arable land above the Gaula when it was at its peak in 1965. Macropterous species occur in spots just emerged from the water (Sample II-3, Table IV), suggesting that they stayed there during the flooding. Thus no observations of any kind are available indicating that the beetles fly away from the river bank during the spring floods. During summer floods, some of the beetles probably leave the spots by flight, as the temperatures on the ground and in the air just above the water are higher.

Some Staphylinidae, such as *Gnypeta* spp. and *Bledius* spp. are able to fly directly from the water (Joy 1910, Larsen 1936). Carabidae fly only when the air and water temperatures are very high.

The survival time on the surface of cold water is long according to experiments with *Bembidion* spp. and in calm places they should consequently be able to survive even a long stay in the river. If there are stronger currents the situation is less favourable, as the beetles are probably often forced under water. Constantly submerged adult beetles soon sink and often have a rather short survival time. However, probably only a few animals are exposed to strong currents for a longer time. The current velocity is usually relatively low at places where the edaphic conditions for the bank-living species are satisfactory, i.e. where the river deposits material —mostly on the inner side of its meanders.

During floods it is observed that flotsam and scum containing the animals, accumulate on trees and bushes. They survive in this, or by climbing trees or bushes, experiments having shown that at least some of the species are active on the water surface at the actual temperature during flooding (6-8°C). Large numbers of insects were taken by the floods on the Gaula in 1965, and they were able to survive nine days or more in the manner described above (Sample II-3, Table IV, Sample

III-1, Table V, and perhaps Samples II-1, Table IV).

Stickel (1948) and Shelford (1954) relate similar experiences from rivers in the U.S.A. On islands previously submerged for two months, the latter author found a rather rich insect fauna, among others a Carabid beetle which had clearly spent the period in the river. The assertion of Lehmann (1965) that Carabid beetles should not be able to survive for 14 days on an island submerged by water most probably is correct only if the island lacked trees and bushes.

During inundations the imagines of fossorial beetles *(Clivina fossor, Dyschirius* spp., *Bledius* spp., *Psammodius asper,* and *Aegialia sabuleti)* are partly forced out of their burrows and accumulate in the manner described above (Sample III-1, Table V). However, in silty substratum some individuals of these species are able to survive, buried in the submerged earth, even for quite long periods (Samples IV, Table VII).

The experiments indicate that a greater proportion of *Psammodius asper* than *Bledius* spp. stays buried during inundations, but all the specimens remaining in the substratum were dead after a submergence of seven days at 18-20°C. Submerged beetles have a longer survival time at low temperatures than at high (Palmén 1945, Hurka 1956), but ability for long survival submerged in the river is hardly attributable to low temperatures alone, as the experiments showed that *Bledius* spp. mostly live only a short time in cold water. Larvae of *Melolontha hippocastani* F. lived longer in soil than in sand or water alone, but about the same time in sand and water alone (Hurka 1956). If there is little current, sites with compact silty ground with a surface layer mixed with humus covered with some vegetation, as in Samples IV (Table VII), seem to remain intact during floods, and burrows probably retain air. In spots of obviously similar type, several *Bledius* species could survive submerged for weeks (Larsen 1936). As no compact humus-mixed surface layer existed in the experiment with *Psammodius asper* and *Bledius longulus,* the air was clearly forced out of the burrows, and the beetles were consequently killed. If currents exist in flooded areas and the substratum is coarser, the fossorial species (incl. *Bembidion argenteolum, B. lapponicum,* and *B. velox)* are forced out of their burrows (as indicated by experiments) or, if not, most of them are probably killed.

Even in years with exceptionally long flood periods, a new generation of Coleoptera is able to develop. Thus immature specimens of, among others, *Bembidion litorale, B. petrosum, B. semipunctatum, B. femoratum, B. bruxellense,* and *Tachyusa leucopus* were found in August 1965; the size of the population of *Bembidion schueppeli* in June 1966 was rather high and immature beetles of *B. lunatum* were taken during and after the flood until mid-July.

It is likely that the new generation of the imaginal hibernators of *Bembidion* spp. in 1965 partly originated from eggs deposited after the inundations. The period between the draining of the spots and the finding of immature beetles was nearly two months, a period probably sufficiently long to produce a new generation. Many females had not deposited all their eggs before the flood, since the egg-laying period for most species is from May to late June or July (Andersen in prep.). Experiments reveal that females of beetles at low, in contrast to high, water temperatures do not deposit eggs, even when constantly submerged, and, as long as the females are alive, the eggs probably remain undamaged. As a distributional factor, transport along the river by the spring floods cannot, contrary to the opinion of Wirén (1954), be regarded as unimportant, compared with transport later in summer.

Some Carabidae and Staphylinidae larvae, mostly those staying on the surface when the sites are flooded, together with larvae having a dense pubescence, e.g. Cantharidae larvae, survive by being washed up (Sample III-1,

Table V). However, as indicated by experiments, most larvae stay submerged in the substratum because they are hypogeic. Eggs, larvae, and pupae no doubt have better chances of surviving in fine than in coarse material, not only due to the above-mentioned causes, but also due to the fact that sites with fine substratum are commonly flooded for a shorter period, as they are often situated higher than those with coarse material. Carabidae larvae occurring on more or less moist ground often had a rather long survival time during the submergence experiments in cold water. Therefore, they are not only able to survive for long periods in silty spots retaining air, but, even on gravelly and sandy ground, several larvae can live submerged for more than a week. Generally, larvae living in moist habitats on river banks are supposed to have this ability to withstand the damaging effect of submergence. The ability of soil-dwelling invertebrates to survive in water is dependent upon the osmotic concentration of their body fluids. This is generally higher for xerophilous than for hygrophilous species, the latter consequently being better situated during submergence (Schwerdtfeger 1963).

Eggs may be rather well protected against absorption of water; many eggs of *Agonum assimile* hatched after exposure to water of 18-20°C for one week, but whether the larvae were undamaged is uncertain. In silty spots the eggs are probably well protected. As egg-laying for several species commonly occurs in May, some of the new generation on the Gaula in 1965, no doubt originated from eggs deposited before the flood began, at least on silty sites.

Imaginal hibernators of Carabidae clearly predominate over larval hibernators on the Rhine (Lehmann 1965), and on moist habitats in England (Murdoch 1967). According to these authors, breeding and development of the autumn breeders, is probably prevented by floods in summer, autumn, and winter. The conditions on river banks treated in the present study are obviously different, since the longest flood periods occur in spring or early summer, and are perhaps of shorter duration. Certainly the imaginal hibernators among Carabidae are numerous on the Gaula, the larval hibernators here constituting 25 per cent (10 out of 40), against about 37 per cent, when all habitats outside river banks around Trondheimsfjorden are taken into consideration (the figures are calculated from data given by Lysholm 1937, Lindroth 1945, Andersen 1960, 1962, and Andersen in prep.). The first figure, however, is so great that the larval hibernators cannot generally be regarded as excluded from river banks, even though the imaginal hibernators may be selected for. Murdoch (1967) is probably right in supposing that the adults are better adapted to surviving inundations than are the eggs and larvae, but it must be stressed that the eggs and larvae in habitats with fine substratum obviously withstand submergence rather well.

Lehmann (1965) found that neither the larval nor the imaginal hibernators are able to develop on the banks of the Rhine, the larvae being killed by summer or winter floods. If the summer floods on the Rhine are not essentially longer than the spring floods on the Gaula, this may seem a little improbable for the imaginal hibernators, because, on both rivers, Carabidae larvae are exposed to inundations. In this case the apparent disagreement may be explained by the probable difference in water temperature during inundations on the two rivers.

HIBERNATION SITES

Samples

Sample A (Table X), the Gaula, station 5, 21 October 1964: Steep slope in the transition between the gravel zone and a dense grassy mat above. Rather elevated. Two hand-sized stones were turned over. Beetles had gathered together in crevices and cavities in the loose earth under the stones.

Sample B (Table X), the Gaula, station 6, 21 October 1964: Elevated gravelly mound in the bush zone.

Table X.
Coleoptera collected on the Gaula in October 1964

	Number of specimens in Sample			
	A	B	C	D
Nebria gyllenhali Schnh. (larvae, 3rd stage)	–	–	abundant	–
Bembidion bruxellense Wesm.	–	–	3	–
B. femoratum Sturm	–	>20	–	–
B. lunatum Dft. (larvae, 3rd stage)	–	–	4	2
B. petrosum Gebl.	98	–	–	–
B. saxatile Gyll.	10	–	–	–
B. schueppeli Dej.	–	–	2	–

Sample C (Table X), the Gaula, station 4, 18-21 October 1964: Tree zone 1 investigated for over one hour. Besides Coleoptera, small flies, spiders (mostly Erigonidae), and Opiliones were common.

Sample D (Table X), the Gaula, station 4, 18 October 1964: Tree zone 2.

Samples E (Table XI), Rundhaug, 14 October 1967: Bare, gravelly, not very elevated areas submerged by the river in spring. Sample E-1 under a tree trunk (about 2 m length, 0.1-0.2 m width); Sample E-2 under a loose stone with an estimated area of about 0.3-0.5 m^2.

Sample F (Table XI), Rundhaug, 14 and 15 October 1967: On elevated, gravelly slopes. Besides the Coleoptera, spiders were collected (*Erigone* sp. and *Lycosa* sp., 5 and 7 specimens, respectively).

Samples G (Table XI), Rundhaug, 10 October 1966 (G-1) and 14 October 1967 (G-2): Sites with fine sand-silt mixture. Sample G-2 taken in a rather elevated spot with sparse vegetation, Sample G-1 in the uppermost part of the river bank in quite well developed vegetation. The sizes of the areas investigated were directly measured.

The abundances given in Table XI are, no doubt, lower than the real abundances, since not all the earth from the spot within the areas could be removed.

Samples H (Table XI), Rundhaug, 10 October 1966 (H-1) and 14 October 1967 (H 2): In the bush zone. Silty ground with dense vegetation. Under bushes of *Salix* sp. The size of the areas investigated was directly measured.

Discussion

Insects living on shores of ponds, lakes, and the sea, often hibernate there or in the immediate vicinity (Larsen 1936, Palmén 1945 and 1949, Krogerus 1948). Some species living beside ponds are supposed to hibernate far away, migrating by flying (Krogerus 1948).

While Lehmann (1965) found it impossible for Carabid beetles to hibernate on the banks of the Rhine because of high water levels in winter, the beetles often live under other circumstances on river banks in Scandinavia. The banks in winter are seldom or never flooded on the Gaula, Saltdalselva, and Målselva, and conditions in this season do not usually seem to be much more unstable than at the above mentioned Fennoscandian habitats. The water level is less stable on the Namsen. Palmén (1945) states that the river banks seem nearly sterile in autumn. The investigations on the Gaula and Målselva in October, however, show that many species hibernate on nearly the same, although often more elevated, sites that they are found on during the activity period. This is the case for imagines of many *Bembidion* spp. (*B. femoratum, B. petrosum, B. prasinum, B. saxatile, B. schueppeli,* and *B. virens*), for larvae of *Nebria gyllenhali* and *Bembidion lunatum,* and for larvae as well as adults of *Bledius* spp. Other typical river bank forms (*Dyschirius* spp., *Hydnobius* spp., *Hypnoides* spp., *Morychus dovrensis* Munst., and many Staphylinidae) hibernate, at least partly, on the river bank.

The hibernation sites, however, probably vary from one year to another, depending upon the flood conditions. So *Bembidion schueppeli* and other species living in more or less dense vegetation were seldom found on the bank of the Gaula in October 1964, although the fauna on similar habitats on Målselva in October 1966 and 1967 was rather

Table XI. *Coleoptera collected on Målselva (at Rundhaug) in October 1966-67. The figures give the number of specimens; the abundance per* m^2 *is given in brackets*

Sample Approximate area (m^2) investigated	E 1	E 2	F	G 1 2	G 2 1	H 1 2	H 2 $^3/_4$
Nebria gyllenhali Schnh. (larvae, 3rd stage)	–	–	1	–	–	–	–
Notiophilus aquaticus L.	–	–	–	–	–	–	1 (1)
Dyschirius septentrionum Munst.	–	–	–	–	–	2 (1)	–
Bembidion bruxellense Wesm.	–	–	–	–	–	1 (< 1)	–
B. petrosum Gebl.	37	111	9	–	–	–	–
B. prasinum Dft.	–	–	3	–	–	–	–
B. schueppeli Dej.	–	–	–	–	–	5 (3)	10 (13)
B. virens Gyll.	1	–	2	–	–	–	–
Staphylinidae (larva, indet.)	–	–	1	–	–	–	–
Bledius sp. (larva)	–	–	–	1 (< 1)	–	–	–
B. arcticus J. Sahlb.	–	–	–	9 (5)	13 (13)	–	–
B. longulus Er.	–	–	–	8 (4)	2 (2)	–	–
Stenus strandi Bck.	–	–	1	–	–	–	–
Lathrobium punctatum Zett.	–	–	–	–	–	–	1 (1)
Quedius pseudolimbatus A. Str.	–	–	–	–	–	2 (1)	1 (1)
Mycetophorus splendidus Gr.	–	–	–	–	–	–	1 (1)
Tachinus marginellus F.	–	–	–	–	–	–	2 (3)
Oxypoda procerula Mnh.	–	–	–	–	–	–	3 (4)
Hydnobius tibialis J. Sahlb.	–	–	–	1 (< 1)	–	–	–
Hypnoidus pulchellus L.	–	–	–	3 (2)	1 (1)	–	–
Cantharidae (larva, indet.)	–	–	–	1 (< 1)	–	–	–
Morychus dovrensis Munst.	–	–	–	1 (< 1)	–	–	–
Cytilus sericeus Forst.	–	–	–	2 (1)	–	1 (< 1)	–
Syncalypta cyclolepidia Munst.	–	–	–	–	–	1 (< 1)	–
Aegialia sabuleti Panz.	–	–	–	–	–	1 (< 1)	–
Aphodius piceus Gyll.	–	–	–	–	–	1 (< 1)	–

rich. As there was a very large inundation on the Gaula at the end of August 1964 (cf. Table I), most of the insects were probably forced out of their usual habitats, without recolonizing the bank, and consequently hibernated further from the river.

Nothing is known about the hibernation of many other beetles, such as several *Bembidion* spp., and many Staphylinidae, probably hibernating as adults (*Ancyrophorus* spp., *Thinobius* spp., *Stenus* spp., *Tachyusa* spp., *Gnypeta* spp., *Atheta* spp., and others). There is some evidence for hibernation on the most elevated sections of river banks (tree zone 2) for *Bembidion semipunctatum* and *B. quadrimaculatum* (Andersen in prep.), but the others may equally well hibernate far from the river, migrating by flying.

Some of the *Bembidion* species, e.g. *B. petrosum* and *B. saxatile*, show a very strong aggregation need during hibernation. This feature is rather common among several types of poikilothermic animals (Allee 1931). Greenslade (1964) has discussed the possible advantages of aggregations in Carabidae.

Inundations commonly occur simultaneously with drifting of ice on the Tana, but only occasionally on the Namsen and the Gaula. On the latter river, this was the case 1 May 1966, but it did not seem to have any severe effect upon the population of at least *Bembidion schueppeli*. However, the inundation was very short and the uppermost sections of the river bank were partly free of water. When the inundations under such circumstances are of longer duration the spring floods are supposed to have a more severe effect upon the fauna hibernating on the lower lying sections of the river bank, and a partial extermination of the populations is not unlikely. This may be the case for, among others, *Bembidion petrosum*, which hibernates in great numbers under trunks and stones in sites submerged by the spring floods (cf. Sample E, Table XI). However, further studies of this are needed.

ACKNOWLEDGEMENTS

I am indebted to the following persons and institutions: The Norwegian Research Council for Science and the Humanities, for financial support; Dr. A. Strand, for checking and identifying some specimens of Coleoptera; Norges Vassdrags- og Elektrisitetsvesen for giving me permission to use unpublished data; and R. Binns, B. Sc., for checking the English.

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Acclimation to low temperatures in *Tribolium confusum* Duval (Col., Tenebrionidae)

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Abstract: SÖMME, L. 1968. Acclimation to low temperatures in *Tribolium confusum* Duval (Col., Tenebrionidae). *Norsk ent. Tidsskr.* **15,** 134-136.

The mortality at 0 °C in adult *Tribolium confusum* Duval, acclimated at 27 °C and 12 °C was investigated. Mortality in beetles acclimated at 27 °C was about twice that in beetles acclimated 4 days at 12 °C. The gain in cold-tolerance is at first very rapid. A period of 3 hours at 12 °C reduced mortality after 4 days at 0 °C from 85 to 47 per cent. Further decreases in mortality rates were observed with increasing acclimation time at 12 °C up to six to eight days.

No compensation for low temperatures in the form of increased oxygen consumption was found. The results indicate that variations in resistance and capacity adaptations are based on different physiological mechanisms in adult *T. confusum.*

As pointed out by several authors (e.g. Prosser 1967), acclimation at various temperatures may result in two main types of responses in insects and other poikilotherms. Some insects acclimated at low temperatures show increased activity and metabolic rate within their normal temperature range, often termed a capacity adaptation. In other cases cold-acclimation results in an increase in cold-tolerance; in other words an increased ability to tolerate more extreme, low temperatures (resistance adaptation).

While several cases of both kinds of adaptations have been described from insects, as reviewed by Precht (1967), the two types have rarely been studied in the same species. An exception is given by Precht (1967), who found resistance adaptation but no capacity adaptation in *Ischnodemus sabuleti* Fall. Similarly Sømme (in press) found variations in cold-tolerance in larvae of *Ephestia kuehniella* Zell., while no change in metabolic rate was recorded following acclimation at various temperatures. In *Tribolium confusum* Duval, Edwards (1957, 1958) found that the ability to survive at —3° C may be enhanced by cold-acclimation, while the metabolic rate was decreased.

A gain in cold-tolerance may be measured in several ways. Exposures at chosen temperatures for various time intervals will give information on mortality rates, chill-coma temperatures on the limit of activity, and supercooling points on the limits of survival. Furthermore a gain in cold-tolerance may include changes in the temperature limits for functions like growth, reproduction, and development.

Using chill-coma as a criterion Colhoun (1960) found that the maximum gain in cold-tolerance in *Blatella germanica* L. could be achieved within a few hrs. Important changes in supercooling points within a few days, depending on acclimation temperature and physiological conditions of the insects, have, for instance, been reported by Sømme (1964). The rate of mortality at low temperatures was greatly influenced by a 24 hrs acclimation period in larvae of *Aedes aegypti* (L.) (Mellanby 1959). It appears that the gain in cold-tolerance is a rapid process, but apart from the observations mentioned above, this process has been inadequately investigated.

In the present study variations in metabolic rate and ability to survive at low temperatures were investigated in *Tribolium confusum* Duval, following acclimation at a high and a low temperature. In order to provide more data on the rate of gain in cold-tolerance, the ability to survive exposures at 0° C was studied after various periods of acclimation at 12° C.

METHODS

A laboratory culture of *T. confusum* was maintained at 27° ± 1° C on sifted coarse wheat flour to which 5 per cent brewer's yeast had been added. Adult beetles to be used in the experiments were aged for one to two weeks at 27° C. Beetles taken directly from this temperature are considered as warm-acclimated, and beetles kept for various periods at 12° ± 0.1° C as cold-acclimated. Mortality after various exposure times at 0° ± 0.1° C was studied in warm-acclimated beetles, and beetles acclimated 4 days to 12° C. The rate of gain in cold-tolerance was investigated by varying the acclimation period at 12° C from 3 hrs to 8 days, after which the mortality after 4 days at 0° C was recorded. Tests at 0° C were run in several replicates, using a total of 200 to 500 beetles for each exposure time. After exposures at 0° C the beetles were left for one day at room temperature to recover, and those unable to walk were counted as dead.

Oxygen consumption in beetles acclimated at 27° C and 4 days at 12° C was measured in a Kirk respirometer. The experimental temperature was 22° C, and all beetles were kept for one hour at this temperature before measurements were started. Recordings were made at 30 min intervals; the duration of the tests varied from 1.5 to 3 hrs.

RESULTS

Compared to warm-acclimated beetles, beetles acclimated 4 days to 12° C had greater ability to survive exposures at 0° C (Fig. 1). The time required to kill 50 per cent was 2.9 days for warm-acclimated and 5.6 days for cold-acclimated beetles. Corresponding 90 per cent values were 4.3 and 7.7 days. Thus the mortality was almost halved in cold-acclimated beetles, showing an ability for resistance adaptation in this species.

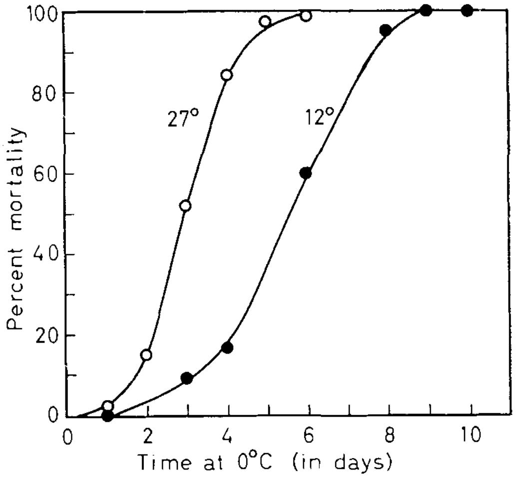

Fig. 1. Mortality at 0 °C in warm- and cold-acclimated *T. confusum*.

Fig. 2 shows mortality after 4 days at 0° C following various acclimation periods at 12° C. An acclimation period of only 3 hrs reduced mortality from 85 to 47 per cent. After that the slope of the curve is gradually reduced, until the curve becomes almost horizontal after 6 to 8 days of cold-acclimation. Thus the gain in cold-tolerance is at first very rapid, while its completion requires several days.

Oxygen consumption at 22° C in warm- and cold-acclimated beetles is presented in Table

Table I. *Oxygen consumption at 22 °C in warm- and cold-acclimated T. confusum*

Acclimated temperature	No. of measurements	$mm^3 O_2/g/hr$
27 °C	28	751 ± 27.3[a)]
12 °C	27	554 ± 15.9

a) $\bar{x} \pm s_{\bar{x}}$; difference sign. at 0.1 per cent level

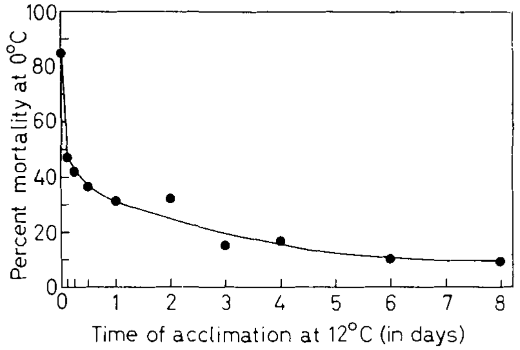

Fig. 2. Mortality after 4 days at 0 °C in *T. confusum* acclimated for various periods at 12 °C.

I. Apparently there is no compensation for the lower temperature in the form of increased metabolism. On the contrary, cold-acclimated beetles have lower oxygen consumption than warm-acclimated ones.

DISCUSSION

The results agree with those of Edwards (1957, 1958), showing an increased survival ability, but no increase in metabolic rate in cold-acclimated, adult *T. confusum*. A compensation for low temperatures in the form of increased oxygen consumption, as is found in some other insects (Marzusch 1952, Dehnel & Segal 1956), appears to be missing in this species. The reduced oxygen consumption, termed an undercompensation by Precht (1958), suggests that cold-acclimated. *T. confusum* are less fitted for activity at low temperatures. As in other cases, where resistance and capacity adaptations have been studied in the same insect species, the results indicate that the two types are based on different physiological mechanisms.

As pointed out in the introduction, variations in cold-tolerance may be measured in several ways. At present it is not known to what degree the various responses to cold-acclimation are related. The present study shows that the ability to survive at low temperatures is rapidly increased during cold-acclimation. A mechanism like this may be of importance for survival under natural conditions, where a drop in temperature will make the insects more cold-tolerant within a short time.

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Unciger foetidus (Koch 1838), (Diplopoda), New to Norway

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Abstract: MEIDELL, B. A. 1968. *Unciger foetidus* (Koch 1838) (Diplopoda), New to Norway. *Norsk ent. Tidsskr.* **15,** 137-138.
The diplopod *Unciger foetidus* (Koch 1838) is reported new to Norway. Twenty-three specimens were collected in 1964 and 1967-68 in Fana, just to the south of Bergen in Western Norway. It seems to have a synantrope distribution there.

10 ♀♀, 9 ♂♂, and 4 juv. of *Unciger foetidus* (Koch), a diplopod new to Norway, have been found in Fana, just to the south of Bergen. This species is the first of the subfamily Brachyiulinae, of the family Iulidae, to be found in Norway.

The first specimen (1 ♂) was collected at Fantoft 14/5 1964 (leg. et det. H.Kauri). All the rest of the specimens were taken at the locality of Tveitevannet, described in my notice on *Microchordeuma gallicum* (Meidell 1968). The specimens were collected under stones and rotten pieces of timber at the litter-covered part of the area. The finds are:

1967: 15/4 2♂♂+2♀♀, 21/5 1♂, 7/9 3♀♀, 19/10 1♂
1968: 23/5 2♂♂+3♀♀, 17/6 2♂♂+1♀+4 juv, 9/9 1♀

Unciger foetidus is easily distinguished from the other species of the family Iulidae, by a forward-pointing hyaline-like process from the sub-anal scale (ventrale scale, by Blower 1958), Fig. 1. Measurements of the specimens (in mm.):

♂♂: Length 20.8-24.2. Width 1.4-1.7
♀♀: Length 25.8-27.5 Width 1.8-2.2

The overall colour is brown to dark-brown (almost black). The female is clearly lighter than the male. The mottled appearance is thereby more pronounced in the male. The immature stages found in midsummer, are quite light-brown. The segments are more 'sausage' shaped than usual in the family. The metazonites have distinct longitudinal grooves. The number of setae increase posteriorly. The legs are lighter in colour than the body. There is no caudal projection at the telson. In the male, the first pair of legs are modified, and have the form of hooks.

The gonopods correspond exactly to those given by Schubart (1934, Fig. 430).

The ocelli form a triangular shape, and are strongly pigmented. Each ocellus can be clearly seen. The number of ocelli varies from 35-43. Schubart (1934) mentions 32-52 from his specimens collected in Germany.

Further, Schubart (1934) reports *Unciger foetidus* from the following countries: Netherlands, Denmark, Sweden (incl. Gotland), Estonia, Latvia, Poland, Romania, Yugoslavia, Albania, Hungary, Austria, Czechoslovakia, and Italy. He also points out that the distribution in Germany seems dependent on calcareous-rich soil.

Lohmander (1925) has found *Unciger foetidus* in the south, middle, and eastern parts of Skåne, Blekinge, Halland, and Göteborg. From his collecting in Denmark, Lohmander (1957) has found a wide distribution there. He mentions East Central-Europe as being the origin of *Unciger foetidus's* expansion toward

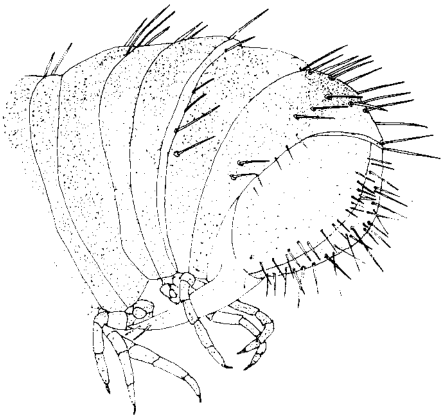

Fig. 1. The rear end of a female *U. foetidus* (Koch), showing the forward-pointing hyaline process on the sub-anal scale.

the west and north. He compares it with that of *Polydesmus complanatus,* and points out that the similarity is restricted to the directions of spreading, not by which means it has occured. *Unciger foetidus* has, at least in some regions, a synantrope distribution. One may, proceeds Lohmander, ask if *Unciger foetidus* can be regarded as belonging to the original fauna of Denmark at all. It seems probable that old mansion gardens could be the centers of *Unciger foetidus* expansion there.

As a species with a clear eastern distribution, *Unciger foetidus* must have had a synantrope entry to the coast of West Norway. Most of the diplopod fauna here is West-European in character, even those species which seem to have a synantrope distribution, like *Microchordeuma gallicum* and *Polydesmus angustus* (the corresponding eastern species are *M. voigti* and *P. complanatus).*

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Einige Notizen über die Artberechtigung von *Amischa sarsi* Munst. und die Geschlechtsmerkmale von *Amischa cavifrons* Sharp (Col., Staphylinidae)

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Abstract: STRAND, A. 1968. Einige Notizen über die Artberechtigung von *Amischa sarsi* Munst. und die Geschlechtsmerkmale von *Amischa cavifrons* Sharp (Col., Staphylinidae). *Norsk ent. Tidsskr.* **15**, 139-140. Der Verfasser hält, im Gegensatz zu Benick (1967), *Amischa sarsi* Munst. für eine von *A. soror* Kr. verschiedene Art, und weisst nach dass die Aufgaben Munsters (1927) betreffs *A. cavifrons* Sharp nicht, wie Benick (1967) vermutet, falsch sind.

In seiner *Amischa*-Arbeit sagt Benick (1967) u. a. folgendes: «Im Vertrauen auf besonders Ganglbauer hat Munster angenommen, *forcipata* sei mit *soror* identisch und beschrieb daher seine *sarsi*. Sie ist eindeutig synonym zu *soror*. Die von ihm gebrachte Zeichnung des 6. Ventralsegments des ♂, die Strand übernommen hat, ist insofern nicht richtig, als die reguläre Borstenzahl jederseits 4 beträgt, wie eine Anzahl von Männchen dieser Art ergiebt.»

Munster (1927) hat darauf ausdrücklich hingewiesen, dass das ♂ seiner *sarsi* nur 4 Borsten am 6. Ventralsegment hat ('I have seen 19 male specimens, all absolutely alike').

In meiner mehr als 50-jähringen Sammlerzeit habe ich eine Reihe ♂♂ von *sarsi,* alle mit 4 Borsten (ausgenommen ein Exemplar mit einer überzähligen Borste) gefunden. Palm (*i. l.*) hat *sarsi* in Schweden zahlreich gesammelt. Tiere die als ♂♂ von *soror* (mit 4 + 4 Borsten) gedeutet werden können, sind mir bekannt weder in Norwegen noch in Schweden gefunden.

Die zwei Formen scheinen eine verschiedene Ausbreitung zu haben. Ob *sarsi* als Art oder Rasse angesehen werden soll, darüber kann man streiten, sie aber ohne jede Begründung mit *soror* zusammenzuschlagen, wie es Benick (1967) tut, ist zu weit zu gehen. Ich halte jetzt wie früher (Strand 1951) *sarsi* für eine eigene Art.

Benick hat mir ein ♂ von *soror* überlassen, wofür ich ihm danke. Wie aus den Fig. 1 und 2 hervorgeht, ist das 6. Ventralsegment beim ♂ von *soror* stärker vorgezogen und der Hinterrand sehr schwach und einfach ausgerandet mit gerundeten Hinterecken und mit 8 Borsten, während bei *sarsi* das 6. Ventralsegment weniger vorgezogen und der Hinterrand tief, doppelbuchtig ausgerandet ist, mit winkelförmigen Hinterecken und mit 4 Borsten.

Weiter sagt Benick (1967): «Zu bemerken ist übrigens, dass das ♂ von *cavifrons* am Hinterrand des 6. Ventralsegments regulär je 4 schwarze Borsten trägt, nicht wie bei Munster und Strand angegeben, je 3 Borsten. Die Angabe Munsters das ♀ von *cavifrons* habe auch wie das ♂ eine ausgehöhlte Stirn, ist falsch».

Was Munster (1927) sagt ist folgendes: «*A. cavifrons* Sharp. The smallest of our three genuine *Amischa,* the male easily distinguished from *analis* by its impressioned head and the peculiar angustated shape of the last sternit; the female is only distinguished by its shorter elytra and often difficult to determinate».

Benick hat wohl übersehen dass die Tabelle

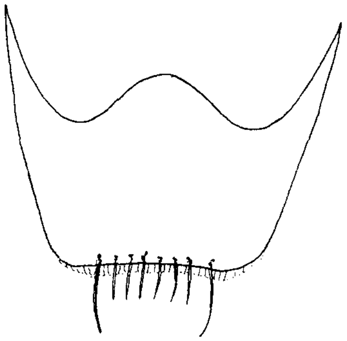

Fig. 1. *Amischa soror* Kr. 8. Dorsalsegment und 6. Ventralsegment des ♂.

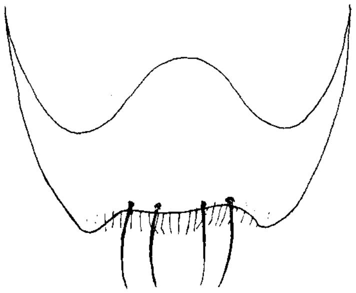

Fig. 2. *Amischa sarsi* Munst. 8 Dorsalsegment und 6 Ventralsegment des ♂.

wo die Stirn von *cavifrons* erwähnt ist, folgende Einleitung hat: «The males of the last 3 species are easily distinguished as follows».

Die ♂♂ von *cavifrons* sollen infolge Benick (1967) «regulär je 4 schwarze Borsten» tragen, und nicht, wie von Munster angegeben, je 3, d. h. im ganzen 6.

In der Originalbeschreibung Sharps (1869) heisst es: «aiso in this sex of *H. cavifrons*, the ventral plate of the seventh abdominal segment is considerably produced (as in *H.soror)*, and the hind margin is furnished in the middle with a bunch of five or six distinct black hairs».

Was Munster sagt ist folglich mit der Originalbeschreibung übereinstimmend. Die Zahl 4+4 dürfte doch die normale sein.

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Some Records of Diplura from the Oslo Area

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Abstract: BÖRSET, E. 1968. Some records of Diplura from the Oslo area. *Norsk ent. Tidsskr.* **15**, 141-143. A survey is given of formerly published records of Diplura in Norway. Because of systematic revision only *Campodea plusiochaeta* Silvestri can be stated as previously found. In May and August 1968 Diplura were collected in five of eleven investigated localities in the Oslo area. *C. plusiochaeta* and *Campodea fragilis* Meinert were found together in three localities, and *C. plusiochaeta* separately in two localities. Both species appear to be quite common in rich soils of the Oslo area.

Diplura, like the other orders of the aperygote insects, have been investigated very little in Norway. Natvig (1928) mentions one or two species of the order Diplura, and Bakke (1961) mentions two species which have been found in Norway.

In Sweden Agrell (1944) has recorded five species, and in Denmark four species have been found (Arevad 1957). The most widespread species in Sweden and Denmark are *Campodea fragilis* Meinert 1865 (Fig. 1) and *Campodea plusiochaeta* Silvestri 1912 (Fig. 1) (Arevad 1957, Agrell 1944, Brinck 1961).

EARLIER NORWEGIAN RECORDS

With the exception of one find of *C. plusiochaeta* in the Aurlands Valley (Løken 1966), all other published records of Diplura are from around 1900. At this time Lie-Pettersen investigated the apterygote fauna. In two of his publications he describes finds of Diplura. In a survey of apterygotes in northern Norway (Lie-Pettersen 1905), he mentions *C. fragilis* found in a birch wood near the foot of Fløy Mountain in Tromsø. The same species is also found under stones in Vega, Helgeland. In a similar survey from Sogn and Nordfjord (Lie-Pettersen 1898), he notes that *C. staphylinus* is very commonly found in Lærdal, Stryn, and Nordfjord. *C. fragilis* is stated as being common under stones in Bergen.

Since Lie-Pettersen published his finds, the genus *Campodea*, to which all Scandinavian Diplura belong, has been thoroughly revised.

According to the old classification, the genus *Campodea* included only the species *C. fragilis* and *C. staphylinus*, which were separated by short or long hairs on the cerci. Later it became apparent that the classification on the basis of hairs on the cerci only was not sufficient. Since the Lie-Pettersen collection is assumed to be lost (A. Löken, personal communication), we can only rely on *C. plusiochaeta* as being definitely recorded from Norway.

OWN OBSERVATIONS

In May and August 1968, Diplura were found in five of eleven investigated localities in the Oslo area. All finds were under stones lying some centimetres underground. The *Campodea* species move very rapidly, and hide in grooves and cracks as soon as they are exposed to light. Therefore, the number of species observed is higher than the number collected.

Identification was undertaken according to Arevad (1957) and Delany (1954). A description of localities and number of specimens collected are given below.

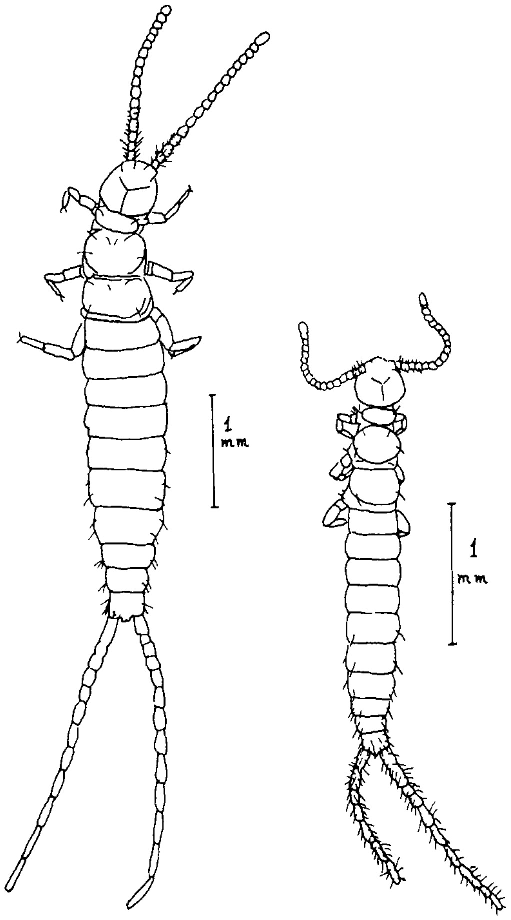

Fig. 1. Left. *Campodea fragilis* Mein.
Right. *Campodea plusiochaeta* Silv. After Arevad (1957).

1. Årungbukta, Frogn, 8. 5. 1968: Hillside facing southwest. Growth of 15 m high ash trees (*Fraxinus excelsior* L.), with other deciduous trees scattered around. The ground flora predominantly *Convallaria majalis* L., *Anemone hepatica* L., *A. nemorosa* L., *Filipendula ulmaria* L., and *Carex digitata* L.

Three *C. plusiochaeta*.

2. Linderud, Oslo, 12,5. and 18,5. 1968: On a dry southward slope on lime rock. Dense bushes, consisting primarily of hazel (*Corylus avellana* L.). The ground vegetation consisted of *Convallaria majalis, Anemone nemorosa,* and *Melica nutans* L.

Twenty-four *C. plusiochaeta* and twelve *C. fragilis*.

3. Syverud, Ås, 16. 5. 1968: A small group of beech trees (*Fagus silvatica* L.) about 10 m high. On the ground *Convallaria majalis,* and dry beech leaves.

Ten *C. plusiochaeta* and two *C. fragilis*.

4. Åros, Røyken, 26. 5. 1968: Under a maple tree (*Acer platanoides* L.) on an eastward slope adjacent to a grass lawn. No ground vegetation, but a thick layer of dry leaves.

Three *C. plusiochaeta* and two *C. fragilis*.

5. Vollebek, Ås. 22. 8. 1968: On the side of a ditch between sprucewood and a cultivated field. Some birch (*Betula odorata* Bechts.). Predominantly *Agrostis tenuis* Sibth. on ground.

Two *C. plusiochaeta*.

DISCUSSION

These observations show that both *C. plusiochaeta* and *C. fragilis* seem to be common in the Oslo area. Both species occurred together in three of the localities. They were even found under the same stone. This similarity in choice of habitat is also commented upon by Arevad (1957) and Agrell (1944).

All the present records of Diplura are in relatively rich soil. Localities 1, 2, and 3 can be classified as thermophile, broad-leafed forest, while localities 4 and 5 were strongly influenced by cultivation. My finds agree with Brinck (1961), who says that Diplura in Sweden are found primarily in deciduous forests or on moist fields with grass cover.

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Received 16 September 1968

Magne Opheim 70 år

Den 10. oktober 1968 fylte sivilingeniør Magne Opheim 70 år. Opheim er født og oppvokst i Bergen. Etter å ha tatt eksamen artium drog han til Trondheim for å studere ved Norges tekniske høgskole, hvor han fullførte eksamen ved kjemilinjen i 1925. Året etter gikk ferden til Amerika til forskjellige stater øst, vest og sør i USA. I 1936 var han tilbake i Norge hvor han startet sin egen bedrift, A/S Norsk Oxyd, på Bryn i Oslo.

Helt fra guttedagene av har Opheim næret en sterk interesse for studiet av insekter og for insektsamling. Og fra første stund var det sommerfuglene som ble viet størst oppmerksomhet. Naturlig nok søkte han tidlig samarbeid med Bergens Museum, hvor professor August Brinkmann sen. støttet opp med reisebidrag for innsamling av insekter til museet, mest steinfluer og sommerfugler, fra Lærdal i Sogn, 1926. Også i studietiden i Trondheim så han seg tid til innsamling av lepidopterer i byen og i Bymarka. Under sitt opphold i Amerika samlet han hvor han fant anledning til det, slik som i Mojave Desert i California.

Opheim har i høyeste grad interessert seg for forekomst og utbredelse av lepidopterne i Norge. En lang rekke publikasjoner fra hans hånd vitner om omfattende kunnskaper på dette området. Og særlig stor oppmerksomhet har han viet visse arter som i sin utbredelse er knyttet til våre høyfjellstrakter, *Parnassius apollo* ssp. *jotunensis* Opheim, *Albulina orbitulus* Prun., *Pyrgus centaureae* Rbr., *Apamea maillardi* Hb.-G, m.fl. I årenes løp har Opheim målbevisst planlagt og foretatt en rekke reiser til spesielt utsøkte lokaliteter hvor undersøkelser syntes mest påkrevet, og har berettet om sine betydeligste funn i tur og orden.

Et stort arbeid har Opheim utført som medarbeider ved utgivelsen av Frithiof Nordstrøm's kartverk over utbredelsen av Fennoskandia's dagsommerfugler, svermere og spinnere. Også nattflyene er nå ferdigbehandlet og under trykning. I nær tilknytning til dette verk har Opheim utgitt kataloger over følgende norske makrolepidopterer: Part I, Rhopalocera, Grypocera, Sphinges and Bombyces, 1958, og Part II, Noctuoidea, 1962. Meget fortjenestfullt er hans initiativ i forbindelse med offentliggjørelse av Arent Greve's vakre insekttegninger som hadde ligget arkivert og upåaktet mer enn 150 år. Ved hjelp av Greve's beskrivelser og bistand forøvrig fra spesialister på forskjellige grupper insekter, lyktes det ham å få bestemt de aller fleste av Greve's figurer til art. (Universitetet i Bergen Skrifter, nr. 27, 1959).

Vel ingen av våre entomologer har vanket så jevnlig på entomologisk avdeling ved Zoologisk museum på Tøyen, dels i studieøyemed og dels engasjert for å hjelpe til med ordning og nyoppstilling av lepidopterne. Og siden 1962 har Opheim hatt forskningsstipendium fra Norges almenvitenskapelige forskningsråd til støtte for sitt vitenskapelige arbeid. Han har i senere år i sterkere grad ofret seg for studium av mikrolepidopterne. Han har således foretatt revisjon av flere familier og slekter på grunnlag av museumsmateriale og annet materiale, og herunder kunnet påvise forekomst av atskillige arter som nye for Norges fauna, og har forøvrig også beskrevet arter som var nye for vitenskapen.

Opheim har vært medlem av Norsk entomologisk forening siden 1938, og var i en rekke år foreningens kasserer. Han er medlem av Entomologiska Sällskapet i Lund og Wien Ent. Gesselschaft. I 1962 var han å finne blant initiativtakerne til dannelsen av Norsk lepidopterologisk selskap, hvor han ble valgt til redaktør av foreningens medlemsblad «Atalanta».

Opheim er ellers en mann med allsidige interesser ved siden av entomologien. At han er benyttet i offentlighetens tjeneste som domsmann i Oslo byrett i en lang rekke år, er det vel de færreste av hans kolleger som vet.

Vi, alle hans venner og kolleger, vil benytte anledningen her til å takke ingeniør Magne Opheim for givende samarbeid, og for godt vennskap og hyggelig samvær i forløpne år. Takknemlige for alt han har utrettet hittil innen norsk lepidopterologi, vil vi også uttrykke håpet om fortsatt utbytterik innsats fra hans side i tiden fremover, nå, etter at han har passert én av livets milepeler.

Nils Knaben.

Bokanmeldelser

Oldroyd, Harold. 1968. Elements of Entomology, an Introduction to the Study of Insects. Weidenfeld and Nicolson, London. (312 p., 71 fig., 50 fotografier) Pris 45 s.

For enhver som vil gi en samlet fremstilling av et så omfattende fagområde som entomologien, må det sentrale problem bli å gjøre et representativt utvalg blant det veld av opplysninger som står til rådighet. Oldroyd har løst denne oppgaven på en elegant måte, og gir en velskreven og lettlest innføring i mange viktige sider av entomologien. Boken er ikke en vanlig «textbook», men er beregnet som utfyllende lesning for biologistudenter. Som forfatteren selv sier i sitt forord er dette ikke en fullstendig oversikt, men han håper at boken vil gi inspirasjon i studiet av insekter, og fylle ut den rammen som gis av lærebøkenes nøkterne fakta.

Insektenes systematikk har fått en forholdsvis beskjeden plass, hvor det legges vekt på utviklingen av de forskjellige gruppene fra de opprinnelige og primitive former til de nyere og mer spesialiserte ordner. Den største delen av boken er viet insektenes bygning og deres tilpasning til omgivelsene. Syn, lydsignaler og flyving er behandlet i egne kapitler, deretter følger kapitler om tilpasning til liv på land og i vann, og om insektenes spisevaner når det gjelder vegetabilsk og animalsk føde. Ved sammenligninger mellom forskjellige insekter blir det fremhevet hvorledes de forskjellige organer og deres funksjoner har blitt utviklet, som en tilpasning til insektenes levevis og miljø.

Sosiale insekter er alltid fasinerende lesning, og blir enda mer interessant gjennom Oldroyd's fremstilling i de tre kapitlene om termiter, maur, bier og veps. Videre følger en oversikt om skadelige og nyttige insekter, og boken avsluttes med et kapitel om insektenes fremtidige skjebne. Oldroyd imøteser en kjedelig fremtid for de kommende generasjoner av entomologer, når artsutvalget er redusert gjennom menneskenes inngripen i naturen, og alt taksonomisk arbeid utføres av elektroniske regnemaskiner.

Det er ikke mulig å få med alt i en bok som denne, men det kunne allikevel vært ønskelig om de deler av den anvendte entomologien som angår landbruket, hadde fått større plass. Anvendt entomologi er idag et stort fagområde, og fortjener en bredere omtale også i en generell innføring i entomologien. Man savner også et kapitel om insektenes biokjemi, hvor det kunne vært pekt på noen av de spesielle forhold som særpreger denne dyregruppen.

Boken vil være inspirerende lesning for alle som er interessert i insekter, og spesielt for biologistudenter ved høyskoler og universiteter. Den er også verdt å lese for den mer spesialiserte entomolog, for å friske opp kunnskapene om mangfoldigheten innen insektenes biologi.

Lauritz Sømme

Southwood, T. R. E. (Ed.) 1968. Insect Abundance. Symposia of the Royal Ent. Soc. Lond. *4*. Blackwell Scient. Publ., Oxford and Edinburgh. Pris: 52 s. 6 d.

«*The Royal Entomological Society of London*» (grunnlagt 1833) gir ut fleire seriepublikasjonar, både «*Transactions*» og «*Proceedings*», serie A, B og C, og dessutan den nyttige «*Handbooks for the Identification of British Insects*».

For ein del år sidan byrja selskapet også å sende ut ein ny type publikasjonar. Sidan 1961 har det annakvart år arrangert symposia over utvalde emne innafor entomologien, og det framlagde materialet har blitt gitt ut i bokform. Etter «*Insect Polymorphism*» (1961), «*Insect Reproduction*» (1964), og «*Insect Behaviour*» (1966), har nå fjerde bind i serien kome, det omhandlar spørsmål omkring populasjonsdynamikken hos insekt.

Boka inneheld 13 kapittel, alle av forskjellige forfattarar. I tillegg er der korte referat av diskusjonsinnlegg. Delvis blir spesielle granskingar framlagde og drøfta. Det gjeld t.d. arbeid av Klomp om furumålar *(Bupalus piniarius)* og av Varley og Gradwell om liten frostmålar *(Operophtera brumata)*. Til saman gir slike artiklar eit interessant innsyn i korleis ulike forskarar gjennomfører populasjonsstudier og analyserer resultata.

Andre artiklar er meir drøftingar av spesielle problem utan at det er knytta på same måte til eigne biologiske granskingar. Her fins det interessante artiklar av t. d. Henson, Holling, og Huffaker et. al. I eit innleiande kapittel har Richards og Southwood gitt eit svært så kortfatta og skisseaktig oversyn over ulike teoriar i populasjonsdynamikken. Meir interessant er den avsluttande artikkelen der Wilson samanfattar ein del av dei spørsmål som har vore oppe på symposiet, og peikar på problem som ennå er for lite undersøkt. For norske tilhøve kan det vere av interesse å merke seg det han nemner om utkantområdene i utbreiinga til ein art.

I det heile kastar boka eit verdfullt utsyn over problem innafor populasjonsdynamikken. Saman med andre nyare publikasjonar får ein inntrykk av at det i dag er meir spørsmål om gransking og analyse, og mindre om filosofisk argumentering enn det var for ein del år sidan. Likevel må ein berre vere samd i Wilson's observasjon: «Det er ein tydeleg tendens i populasjonsstudier at granskarane finn forklaringar som harmonerer med deira spesielle teoretiske synspunkt».

Gudmund Taksdal

Wagner, E. 1966. Wanzen oder Heteropteren. I. Pentatomorpha *Tierwelt Dtl. 54.* Gustav Fischer Verlag, Jena. (235 p.). Pris ca. kr. 90,–.

Wagner, E. 1967. Wanzen oder Heteropteren. II. Cimicomorpha. *Tierwelt Dtl. 55.* Gustav Fischer Verlag, Jena. (179 p.). Pris ca. kr. 65,–.

I serien «Die Tierwelt Deutschlands und der angrenzenden Meeresteile» kom det i 1952 ut eit bind om bladteger (Miridae) med E. Wagner som forfatter. Etter ein lang pause har det nå kome to nye tegebind i serien, også skrivne av E. Wagner. Dr. Wagner har med dette utført eit storarbeid, og skapt handbøker som knapt nokon med interresse for tegesystematikk kan vere forutan.

I bind I Pentatomorpha er det først ei kortfatta generell innleiing som vesentleg gir eit oversyn over den delen av tegemorfologien ein bør ha kjennskap til for å nytte bøkene. Proporsjonar mellom ulike målingar er mykje nytta i tabellane. Det er difor viktig å merke seg i innleiinga korleis målingar er utførde.

Bind II omfattar Cimicomorpha. Her kjem bladtegene (Miridae) inn. Delvis på grunn av Wagners eigne talrike publikasjonar, var det nå behov for ei nokså inngåande revidering av Miridaebindet frå 1952. Heile 54 sider av den nye boka er endringar og tillegg til dette bindet. Det vil seie at ein må ha begge bind og nytte dei ved sida av kvarandre.

Bestemmingstabellane er klare og konsise, det same gjeld omtalen av kvar einskild art. Dei talrike illustrasjonane er overlag nyttige, og har mykje av æra for at bøkene stort sett fører raskt og sikkert fram til artsdiagnose. I artsomtalane er det i tillegg til systematisk omtale tatt med kortfatta opplysningar om levestader, utviklingssyklus og geografisk utbreiing. Mange reint nordiske arter har kome med. Dette aukar sjølvsagt nytten av bøkene under norske tilhøve, sjølv om fleire slike arter berre er tatt med i bestemmingstabellane utan at meir inngåande artsomtale er gitt.

Det er først og fremst som bestemmingslitteratur og i omtale av artene at bøkene har stor verdi. Dei høve mindre som mønster for ei systematisk inndeling av Heteroptera. Mellom anna fører Wagner opp dei artene han oppfattar som mest utvikla først, medan det er vanleg i dag å ta til med dei mest primitive.

Nå ventar vi på det planlagde bind III som skal omhandle Hydrocorisae og Amphibicorisae. Når dette har kome vil verket omfatte alle grupper av Heteroptera.

Gudmund Taksdal

Jens Brændegård. 1966. Edderkopper I, Danmarks fauna 72. København (224 p.)

Nestor blant nordiske arachnologer, Jens Brændegård, har med denne bok gitt et verdifullt bidrag til sin allerede store og betydningsfulle produksjon. Han har samlet adskillig av sine rike erfaringer i denne bok, og gjengir det viktigste av det materiale som andre forskere har samlet over dansk edderkoppfauna.

Innledningsvis redegjøres det for innsamlingsteknikk, konservering, oppbevaring og etikettering av materialet, og det henvises også til den viktigste bestemmelseslitteratur. Et kapitel over organologi og edderkoppenes levesett er knapt men oversiktlig forfattet. Verket omfatter 11 familier, dvs. cribellater med fire familier, og av ecribellatene: Oonopidae, Dysderidae, Scytodidae, Pholcidae, Gnaphosidae, Clubionidae og Anyphaenidae. Resten av ecribellatene vil utgjøre innholdet av kommende bind 2 og 3. Underfamilien Micariinae er overført til fam. Gnaphosidae. Blant dictynidene anvendes slektsnavnet *Amaurobius* C. L. Koch for artene *fenestralis, similis* og *ferox,* og ikke *Ciniflo* J. Blackwall som det egentlig skulle. Det har jo imidlertid også sine ulemper å bytte slektsnavn i velkjente navnekombinasjoner.

Når det gjelder innsamlingsteknikken, så berøres ikke den kvantitative innsamlingsteknikk. Det hadde imidlertid vært ønskelig med litt nærmere instruksjoner, særlig hva angår sollmaterialets videre behandling.

Forfatterens bestemmelsestabeller for familier, slekter og arter er kortfattede og klare. Gode tegninger underletter identifiseringen. Hver enkelt art karakteriseres ved hjelp av en beskrivelse, og utbredelsen i Danmark klarlegges. Ytterligere gjøres det rede for den alminnelige utbredelse, artens økologiske miljø, levesett, fenologi, m. m.

Brændegårds bok er et utmerket hjelpemiddel for bestemmelse av de i Danmark forekommende arter, og den gir god orientering i dansk edderkoppfauna. Boken er anvendelig også i de øvrige nordiske land. For norske forhold dekker den en vesentlig del av faunaen. Naturlig nok er ikke fjellformer og en del nordiske arter med, men til gjengjeld omtaler boken en del arter som hittil ikke er funnet i Norge, men som eventuelt kan forekomme her og bli oppdaget i fremtiden.

Boken kan varmt anbefales til alle som har interesse for edderkopper, og den vil også være et verdifullt hjelpemiddel for lærere i gymnaset, særlig når økologisk betonet feltarbeide inkluderes i undervisningen.

Hans Kauri

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LØKEN, A. 1964. Social wasps in Norway (Hymenoptera, Vespidae). *Norsk ent. Tidsskr.* **12,** 195—218.

SCHWARTS, R. J. 1955. *The Complete Dictionary of Abbreviations.* T. Y. Crowell Co., New York.

WHITMAN, L. 1951. The arthropod vectors of yellow fever, pp. 229—298 in STRODE, K. (ed.), *Yellow Fever.* McGraw-Hill, New York and London.

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