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Karyotype Characteristics of Katydid Orthopterans (Ensifera, Tettigoniidae), and Remarks on Their Evolution at Different Taxonomic Levels

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So far, only about 400 species, subspecies, and chromosome races of 15 subfamilies of Tettigoniidae have been studied karyologically, this constituting about 7% of all described species in this group. An attempt was made to establish the basic diploid chromosome numbers of Tettigoniidae and, considering chromosome number, morphology, and the sex determining mechanisms, to suggest how karyotype evolution in the particular subfamilies could have occurred.

Key words: Orthoptera, Tettigoniidae, katydids, karyotype, karyology, chromosomes, evolution.

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The taxonomic value of the karyotype in a species diagnostics, and the fact that chromosome numbers (2n) change from species to species, have long been recognized. The variation of chromosome numbers is determined by the types of rearrangement having preponderantly occurred during the evolution of groups. This tendency for an accumulation of a given type of chromosomal rearrangement was previously suggested as being the result of orthoselection (WHITE 1973), and of the specificities of mutagenesis (DURTRILLAUX *et al.* 1981). However, a more often accepted view is that most of the fixed karyotypic differences which are found between closely related species have arisen after the speciation event, and are a result rather than a cause of genetic isolation. The fixation of structural rearrangements may be the most important, easily comprehendend, cytogenetic correlation with speciation (PATTON & SHERWOOD 1982).

At the lowest level of cytogenetic investigations, chromosomes can be studied (a) as a morphological manifestation of the genome in terms of their microscopic form (position of the centromere), (b) as to their number, and (c) as to their behaviour during meiosis and mitosis. These parameters have contributed into evolutionary relationships among species, genera, families and, additionaly, for aspects of traditional phylogenetics and evolution studied in different group of animals.

Orthoptera are considered to be a classic research material for karyosystematics. Karyotypes of this order were first reported in literature at the beginning of the 20th century by MC CLUNG (1905). In 1951 WHITE reviewed all information concerning the cytogenetics of insects, where Orthoptera furnished evidence, since when they have been cytogenetically one of the most extensively investigated groups (for review see: WHITE 1973; HEWITT 1979; JOHN 1983). However, most information concerns the short-horned orthopterans – Caelifera.

For taxonomists, and now for cytotaxonomists, Ensifera (the long-horned orthopterans) seem to be a very good material for investigations, because they are relatively large and diverse and, in most parts of the world, till now only poorly known. Karyotypic studies have for long been a neglected field of this group, which may be due to their non-economic nature. However, recently, a series of karyotype descriptions of Australian tettigoniids was published (UESHIMA 1993; UESHIMA & RENTZ, 1990, 1991).

The first hypotheses about phylogenetic relationships within Ensifera were put forward at the end of the last century, and were based primarily on morphological and paleontological arguments. Over the last decades, also, karyological data slowly increased in number, though for some taxa they are still scarce.

One of the most important problems of comparative cytotaxonomy is the reconstruction of the basic (fundamental) chromosome number of a given group and, consequently, the elucidation of the evolutionary trends in diversification of those karyotypes.

Within Ensifera, the family Tettigoniidae is represented by more than 1070 genera and about 6000 species, described worldwide. The number of extant subfamilies varies greatly from author to author, ranging from 14 to 24 (KEVAN 1976, 1977, 1982; RENTZ 1985, 1993; GOROCHOV 1988, 1995).

This paper is an attempt to define the basic chromosome number for Tettigoniidae and to suggest the evolution of karyotypes within particular subfamilies, considering chromosome number, morphology, and the sex determining mechanism. Since in this group new descriptions of karyotypes are still being added, and also in connection with the fact that some old evidence – following erroneous determination – is dispersed throughout various subfamilies, all data available from literature, as well as the results of recent studies, were first summarized, and only later the possible evolution of karyotypes discussed.

Table 1 presents the chromosome numbers of 372 species and subspecies published previously and, in addition, of 30 species described for the first time.

Material and Methods

Table 1 contains investigated species together with compilated data concernig previously studied taxa.

The males and females were injected with 0.1% colchicine for 1.5 hours, only certain individuals being left untreated. Testes, ovarioles, and sometimes caeca were then excised, incubated in 0.9% sodium citrate, fixed in ethanol-acetic acid (3:1), and kept further in the fixative or in 70% ethanol. Air-dried preparations were made by squashing tissues in 45% acetic acid and freezing them in dry ice. Some individuals were kept in the refrigerator in ethanol-acetic acid for many years. In this case, the modified method of air-dried preparations of ROŻEK (1994) was applied.

Preparations were stained with Giemsa, or with the C-banding methods, as described by SUMNER (1972) with minor modifications.

Chromosomes were classified according to LEVAN *et al.* (1964). Since the classification of acrocentric or telocentric chromosomes (with very short arms or without short arms, respectively) is very often controversial (WHITE 1973; JOHN & HEWITT 1968), in the present work the notion "acrocentric" has been accepted for description of both acro- and telocentric chromosomes.

The taxonomy of Tettigoniidae was accepted according to GOROCHOV (1988, 1995), and to RENTZ (1993) for the Australian species.

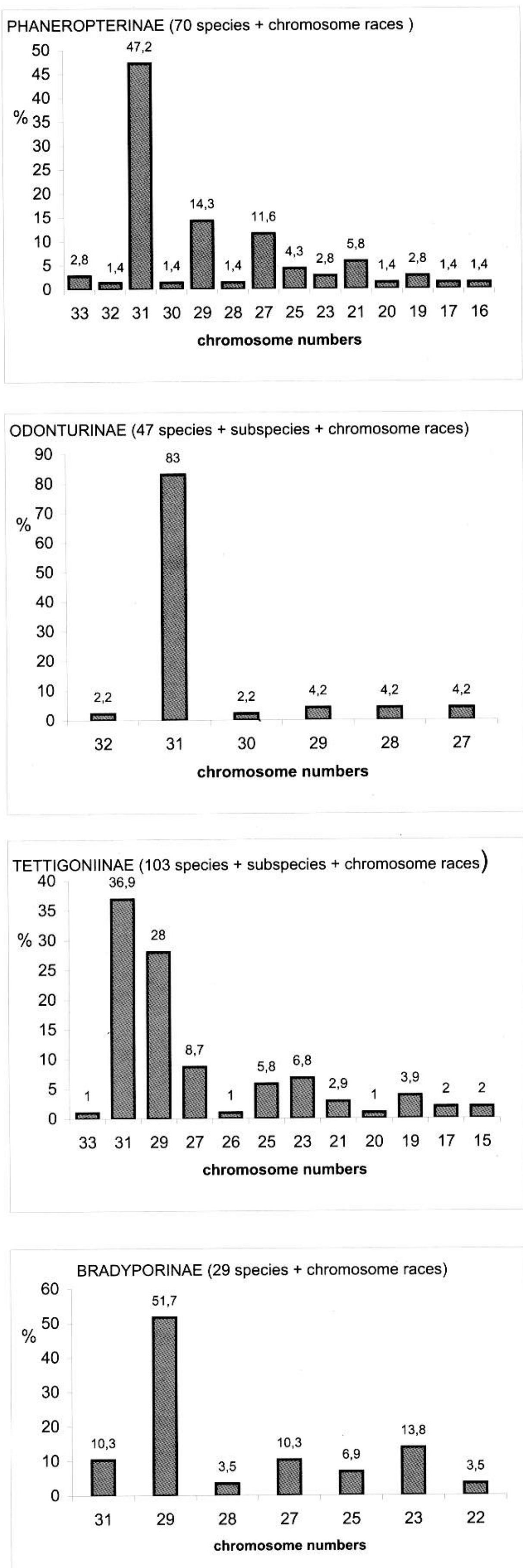
During karyotype analysis, the consecutive subfamilies were not grouped in tribes, with the exception of Bradyporinae. In the majority of Tettigoniidae, the currently applied subdivision into tribes is not reliable and concerns mostly genera joined together for diagnostic reasons, without any relationship to phylogenesis, and without considering monophyletic characteristics. Although RENTZ & COLLESS (1990), on the grounds of a numerical analysis of morphology, recently improved the classification of Tettigoniinae, their results were not taken into account, because the taxonomy proposed does not seem to be clear and final.

In the present paper, within subfamilies, the particular genera and species were classified into groups based on their chromosome number (2n) and morphology (NF = Fundamental Number).

Results and Discussion

Tettigoniidae comprise a large variety of subfamilies and exhibit various chromosome numbers. On the other hand, karyosystematic data in this group are rather scarce, only about 7% of all species being chromosomally recognized. The present karyological analysis reveals that the taxonomic diversity of tettigonids correlates with differences in their karyotype.

Table 1 shows that the chromosome numbers in spermatogonial metaphase of 390 species, sub-



species, and chromosome races (except for species marked by asterisks), representing 147 genera and 15 subfamilies (sensu GOROCHOV 1995), range from 2n♂= 37(XO) in the South American species *Platydecticus anquistifrons* (Nedubinae) to 2n♂= 12(neo-XY) in the Indian species *Euhexacentrus annulicornis* (incertae sedis). The extreme chromosome number 2n♂=39, described by FEREEIRA (1977) in an undetermined species (no. 742) and thus was not included in the Table 1.

Most species in all subfamilies show the XO(♂) and XX(♀) sex chromosome mechanism and this is undoubtedly ancestral, similarly as in other orthopteroid orders (WHITE 1973). About 4% of Tettigoniidae, out of 6 subfamilies, reveal the neo-XY/XX pattern. Only two species have a "multiple sex chromosome mechanism", i.e. the neo-X_1X_2Y/X_1X_2 system.

While the karyology of certain subfamilies and genera has been investigated in more detail, in others it has been ignored. Better known groups possess several interesting features, and the more important ones will now be briefly discussed.

There are two closely related subfamilies: Phaneropterinae and Odonturinae (Odonturinae according to other authors constitute the tribe Barbitistini). Phaneropterinae are distributed world wide, while Odonturinae mostly in the western part of the Palearctic area (to Kashmir and the Altai Mts), and in Ethiopia.

Phaneropterinae. Karyotypes of this subfamily have been most extensively studied. In 70 species and chromosome races belonging to 41 genera, spermatogonial chromosome numbers in males range between 33 and 16 (Fig. 1). The vast majority of species show the XO♂/XX♀ sex determination type, only in six species the neo-XY♂/neo-XX♀ and X_1X_2Y♂ type of chromosomal sex determination being found (Table 1).

The chromosome number 2n♂=31 is represented in 33 species out of 21 genera found at the of Palearctic region, in South America, and India (Fig. 1). However, this number does not concern the eight Australian species. The typical karyotype consists of 2n=31 including only acrocentric chro-

Fig. 1. Histograms showing the frequency distributions of male diploid chromosome numbers (in % of total number of species studied). The height of columns is proportional to absolute numbers of cytotaxonomically examined species within four subfamilies, without species marked in the Table 1 by an asterisk (*).

mosomes (NF=31), probably has been ancestral in Phaneropterinae as a whole. Four species of *Anaulacomera* besides acrocentric autosomes have a metacentric X chromosome (NF=32) which could have been formed as result of a pericentric inversion. The basic NF=31 occurs in *Theudoria melanocnemis* from Brazil, with 2n=30 (neo-XY), and a metacentric X chromosome.

In different species of the genera *Scudderia* and *Holochlora* the karyotypes in males are composed of 31 and 29 acrocentric chromosomes. Probably non-centric fusion changes the chromosome number among species within these genera. In one species of the genus *Holochlora* described from Japan, South Korea, and India, different chromosome numbers may be due to geographical variation. The latter could be a reason of 2n♂=29 and 2n♂=27 karyotypes, consisting of acrocentric chromosome in *Pelerinus* (=*Allodapia*), *Ducetia*, *Kuwayamaea*, *Viadana*, and *Phaneropteropsis*.

Genus *Phaneroptera* is distributed in Central and Southern Europe, Asia, small areas of tropical Africa, and Australia (BEY-BIENKO 1954; RAGGE 1956; HARZ 1969). Two Brazilian species (FERREIRA 1976, 1977), probably incorrectly determained (marked by asterisk), are not disscused here. Three Palearctic species are characterized by 2n♂=27 and the evolution of the chromosome number could have been connected with subsequent non-centric fusions.

Lower chromosome numbers (2n♂=23, 21, 20, 19, 17, and 16) occur rarely and are present in species of different geographic distribution. The karyotype of *Dichopetala brevihastata* consists of 2n=23 chromosomes in the male. The largest pair of autosomes (L_1) is a giant bivalent, containing nearly one-half of the autosomal heterochromatin. It has been suggested that in this bivalent a series of translocations and inversions occured in evolution (MESA & FERREIRA 1977b). On the basis of data known so far, it can be seen, that the Australian species of this subfamily form a separate group with chromosome numbers between 2n=25(XO) and 16 (neo-XY). In *Polichne parvicauda* (FERREIRA 1969) the chromosome numbers range from 16 to 21. The specimen with 2n♂=16 (neo-XY) has two pairs of metacentric autosomes, which brings NF=21. Therefore, they are probably the result of two centric fusions in the 2n♂=21 karyotype, represented also by some individuals of this species.

The highest chromosome number 2n♂=33, with all acrocentric chromosomes (NF=33), is represented in two Mexican species of *Stilpnochlora*. When one assumes that the basic karyotype consists of 2n=31 (NF=31), an evolution to 2n=33 seems difficult to explain. NF=33 was described in *Isopsera* sp. but this species has the neo-XY sex mechanism (31+XY).

Analysis of the chromosomes hitherto studied shows that the subfamily Phaneropterinae has very varied chromosome numbers. FERREIRA (1977) assumed that there were at least two basic karyotypes, 2n=31 and 2n=21, both having acrocentric chromosomes. These karyotypes are believed to have been modified in various ways during evolution. Lower chromosome numbers from both basic karyotypes are also basic for groups of species either having secondarily originated from them owing to the loss of chromosomes, or to the occurrence of a pericentric inversion with subsequent centric fusion (FERREIRA 1977). On the other hand, it cannot be excluded that the 21-chromosome karyotype evolved from the 31-chromosome one, following tandem fusions.

However, also other hypotheses concerning the evolution of the basic chromosome number in this subfamily are possible, and any further discussion will depend on the number of investigated karyotypes of species having a different distribution.

Odonturinae. This subfamily is represented by about 20 genera (GOROCHOV 1995). Up to the present, the karyotypes of 47 Palearctic species (and subspecies) from 9 genera have been studied.

The majority of species belonging to the genera *Ancistrura*, *Barbitistes*, *Isophya*, *Metaplastes*, *Poecilimon*, and *Polysarcus* have supposed ancestral karyotype consisting of 31 acrocentric chromosomes with the XO/XX sex mechanism (Table 1; Fig. 1). In the parthenogenetic species *Poecilimon intermedius* females have the same chromosome number as females of bisexual species. Males of *Barbitistes serricauda* have a 32 chromosome karyotype with the neo-XY sex mechanism, and all chromosomes acrocentric. MESSINA *et al.* (1975) connected the origin of the neo-XY sex mechanism in this species with the occurrence of the B chromosome.

In *Isophya altaica*, *I. brevipennis*, *I. kraussii*, and *Poecilimon laevissimus* besides acrocentric autosomes, a subacrocentric or submetacentric X chromosome occurs, changing the chromosomal arms (NF=32) in the whole karyotype. *I. altaica* and *I. brevipennis* are endemic in the Altai Mts, and in the Carpathian Mts, respectively. Probably pericentric inversion was detected in the X chromosome in these species (MESSINA *et al.* 1975; WARCHAŁOWSKA-ŚLIWA *et al.* 1996).

In *I. hemiptera*, endemic to the Caucasus, the chromosome number is 2n♂=30 (NF=30) and the sex determination mechanism neo-XY. The neo-XY originates from an X-autosome tandem fusion between the original acrocentric X chromosome and the interstitial region of the large/medium size acrocentric bivalent (WARCHAŁOWSKA-ŚLIWA & BUGROV 1998).

Four species of the genus *Leptophyes* are characterized by two chromosome numbers, 2n♂=31 and 2n♂=29(XO). In this case, a tandem fusion changed the basic karyotype, reestablishing the acrocentric condition of chromosomes. The reduced chromosome number in *L. albovittata* and *L. boscii* suggests a close phylogenetic relationship between these two species (WARCHAŁOWSKA-ŚLIWA & HELLER 1998).

Other chromosome numbers are present in the genus *Odontura*. Here, different chromosome numbers in four species are connected with the sex mechanisms: 26+XO and 26+neo-XY. In these species there are differences between NF (27, 28, & 29) which are connected with the morphology of the X chromosome. The evolution of karyotype is probably connected with two tandem fusions and inversions in the X chromosomes.

Thus, in the subfamilies Phaneropterinae and Odonturinae autosome tandem fusion, and in the X chromosome pericentric inversion (which changes the position of the centromere), are the common mode of karyotype evolution. The appearance of the neo-XY pattern in *Isophya hemiptera*, is the only example documented to date of a tandem translocation (WARCHAŁOWSKA-ŚLIWA & BUGROV 1998).

In the following three subfamilies, data concerning their karyotypes are very sporadically presented. They were included in Table 1 only for the sake of its completeness.

Mecopodinae. Only three species of the genus *Mecopoda* with 2n♂=29 and 2n♂=27 with different NF (32, 54, & 56) have been studied. If the basic karyotype of this genus is assumed to be 2n♂=31, the karyotypes with two diploid numbers should have derived from the basic one by a centric fusion and pericentric inversion (ASWATHANARAYANA & ASWATH 1994).

The highest chromosome number in Tettigoniidae was found in **Pseudophyllinae** and **Pleminiinae**. The karyotypes of four species of the genera *Sathrophyllia* and *Phyllozelus* have been known to consist of 2n♂=35(XO) and 31(XO). In *Phyllozelus pectinatus* (NF=36), besides acrocentric autosomes, a metacentric X chromosome occurs. Three species of the genus *Jamaicana* have 2n♂=35(XO) (NF=35), and *Meroncidius intermedius* 2n♂=31, but NF=35 is connected with two pairs of metacentric autosomes. This karyotype could have been formed by two Robertsonian translocations, if the karyotype with 35 chromosomes was ancestral for this subfamily. However, the number 2n=35 (XO) could also have originated from a karyotype with 31 chromosomes by fission of some of them, and was later fixed in these subfamilies. It seems, however, that discussion on the karyotypes in these subfamilies is difficult because the number of data is small.

The following eight subfamilies, Listroscelidinae, Saginae, Hetrodinae, Conocephalinae, Glyphonotinae, Nedubinae, Tettigoniinae, and Bradyporinae, are classified by GOROCHOV (1995) in one group. Some authors consider this group to form one family with numerous subfamilies, while others beleve that it is composed of a number of families (RENTZ 1979).

Saginae. It would appear that reliable karyological data concerning this group, are at present represented only by the karyotype of *S. hellenica.* Previous evidence (marked by asterisk in the Table 1) referring, e.g. to *S. ornata*, could have been the result of erroneous determination of this species, this being suggested by its description from Morocco (KALTENBACH 1990), or by the presence of additional chromosomes in the case of *S. ephippigera.*

RENTZ (1993) described subfamily **Austrosaginae** for some australian predacious Tettigoniidae. GOROCHOV (1995) considers Austrosaginae to be close to Saginae. Nineteen species out of 4 genera have a basic chromosome number consisting of 31 acrocentric chromosomes in the male. Three species of the genus *Psacadanotus* have 29 chromosomes with a metacentric X chromosome, although the origin of the latter is still not clear (UESHIMA 1993). However, when comparing the karyotypes of three bisexual species of *Saga*, which have metacentric X chromosomes (MATTHEY 1946, 1948a&b, 1950), it may be assumed that in *Psacadanotus* a non-centric translocation between austosomes occurred, reducing the basic number 2n=31 to 29. The appearance of the metacentric X chromosome was probably connected with an inversion in this chromosome.

Hetrodinae. Three species of *Eugaster* from Morocco with 2n♂=29 chromosome numbers, all of them acrocentric, were described. If this is considered as a reduction from the basic number 31, then it could be explained as the result of a tandem fusion of two pairs of acrocentric autosomes.

Conocephalinae. In 26 species (and chromosome races), spermatogonial numbers of chromosomes in males ranged from 33 to 19, only the XO/XX sex mechanism having been described to date.

The genus *Conocephalus* (nine species) and two North American species of *Orchelium* are characterized by 2n♂=33. However, only in two species the morphology of chromosomes has been described. Besides acrocentric autosomes and two pairs of large submetacentric ones, a metacentric X chromosome occurs (WARCHAŁOWSKA- ŚLIWA 1984a). Other information comprises only evidence as to the chromosome numbers of the particular species. However, the available literature suggests that within this subfamily species with a metacentric X chromosome are dominant, and that such a chromosome is present also in species with smaller chromosome numbers. In any case, considerations on the evolution of karyotypes in this group are difficult, since data are rather scare, and most of them are difficult to analyse, being published in the thirties or fourties, when chromosome morphology was not a matter of interest.

Microtettigoniini. UESHIMA & RENTZ (1990) quote karyotypes of more than 40 species from 13 genera. In this group chromosome numbers range from 2n♂=33 to 2n♂=15. In *Glenbalodectes* and *Xederra* it is 2n=33(X0) with NF=33. The same number is found also in species from the genus *Conocephalus* (from the Palearctic area and America) and in the genus *Orchelimum* (from America). In both the mentioned genera the chromosome number is 2n♂=31. In the evolution of the karyotype the decrease in the chromosome number can be explained by centric fusion and various numbers of tandem fusions. Detailed information about the pattern of chromosome evolution in these Australian genera is described by these authors.

Glyphonotinae. Only one species with 2n♂=21 (NF=26) has been described so far. However, this karyotype could also have derived from 2n=31, assuming that following Robertsonian translocations two pairs of large metacentric chromosomes appeared, that after pericentric inversion a submetacentric X chromosome developed, and that following a tandem-translocation the number of chromosome arms (NF) became changed. This hypothesis is substantiated by analogy to the well analysed Phaneropterinae, in which the evolution of karyotypes brought about a reduction in the chromosome number from 31 to 16, and where the chromosome numbers also were similar to Glyphonotinae. One might speculate that *Glyphonotus* represents a separate branch of evolution, during which the ancestor had interim karyotypes (BUGROV 1990). Chromosomal data confirm the concept of TARBINSKII (1932) who changed the status of *Glyphonotus* (according to RENTZ & COLLESS 1990 – tribe of Tettigoniinae), erecting a monogeneric subfamily.

Nedubinae. This subfamily is distributed in North and South America. So far, the karyotypes of six species belonging to two genera have been described. In the genus *Neduba* the chromosome number ranges from 25 to 22 in males, with the XO, neo-XY, and X_1X_2Y sex determining mechanisms. UESHIMA & RENTZ (1979) described in great detail the pathways of chromosome evolution and the origin of the neo-XY and X_1X_2Y mechanisms. RENTZ & COLLESS (1990) included this genus into the tribe Nedubini (Tettigoniinae) from Microtettigonini. Nedubini have a chromosome number and chromosome morphology similar to the Australian representatives of the genera *Chlorodectes*, *Lanciana*, and *Ixalodectes*. On the other hand, the South American *Platydecticus angustifrons* has the highest number of chromosomes 2n♂=37(XO) within Tettigoniidae, reported so far. Nevertheless, the systematic position of this genus is not clear. GOROCHOV (1988, 1995) includes it into Nedubinae, and RENTZ & COLLESS (1990) into the tribe Nedubini of Tettigoniinae. This indicates that the karyotype evolution of these two genera most probably proceeded in different ways, resulting in two evolutionary branches.

Tettigoniinae. This is the typical, but not the largest subfamily of Tettigoniidae (about 80 genera). The subfamily is predominantly Palearctic (including North Africa and North America), some decticins also occurring in the southern hemisphere (Africa).

The karyotypes of 100 species out of 35 genera ranges from 2n♂=33 to 2n♂=23 (including subspecies and chromosome races) (Fig. 1). 7 species of *Pediodecticus* are not included here, because UESHIMA & WEISSMAN (1993) quote only chromosome ranges from 2n=28 to 2n=31 in the male.

The highest number of chromosomes, 2n=33♂, in this group was found in *Psorodonotus specularis* – endemic to the Caucasus. The taxonomical status of this genus is not clear. HARZ (1969) described it as being close to the Pholidoptera group, SERGEEV (personal information) includes it in the tribe Pholidopterini.

Most of the Palearctic species of the tribes Platycleidini, Decticini, Gampsocleidini, Ctenodecticini, and Pholidopterini have 2n=31♂ chromosomes, all of them acrocentric (NF=31). WHITE (1941, 1973), HENDERSON (1961), SOUTHERN (1967), and UESHIMA & RENTZ (1979) suggested that this is a modal number of chromosomes in this group.

However, *Metrioptera saussureana*, *Montana daghestanica*, and *Pholidoptera aptera* have one centric fusion of two pairs of autosomes, and a reduced chromosome number to 2n♂=29 (NF=31) (WARCHAŁOWSKA-ŚLIWA 1988; WARCHAŁOWSKA-ŚLIWA *et al.* 1994). *Montana daghestanica* and three species of *Tettigonia* also have one pair of large metacentric autosomes, and a subacrocentric or metacentric X chromosome (NF=32). The morphology of the X chromosome is possibly connected with a pericentric inversion. *Montana tomini*, endemic to southern Siberia and Mongolia, has the same number of chromosomes, but NF=34, with a metacentric X chromosome, and two submetacentric pairs of autosomes. This karyotype could have been formed either as a result of one Robertsonian translocation and two pericentric inversion in one pair of autosome and in the X chromosome.

In the genus *Gampsocleis*, differentation of the chromosome number can be found – 2n=31 and 2n=23. Species of Asiatic distribution have a basic chromosome number (2n=31). From this group only *G. ryukyuensis* has a slightly changed basic karyotype (NF=32), this being the result of differences in the centromeric position of the X chromosome. The metacentric X chromosome in this species may have developed by translocation from the large acrocentric X chromosome in another species with the basic NF=31. On the other hand, *Gampsocleis glabra* (distributed from Spain to western Siberia) and *G. abbreviata* from the Balkans with 2n♂=23, are the most advanced in the structural evolution of the karyotype. Multiple translocations and fusion must have occurred during the chromosome evolution of these species. (WARCHAŁOWSKA-ŚLIWA 1984b).

An argument for the possibly taxonomic revision of the genus *Gampsocleis*, could be the clear differentation of chromosome numbers in species from various geographical distributions.

Ctenodectus major and *C. granatensis* from the Iberian Peninsula have different chromosome numbers, 2n♂=31 (NF=34) and 2n♂=26 (NF=33) with the XO sex chromosome mechanism, while *C. granatensis* has the neo-XY one. A hypothesis of the karyotype evolution of this species was drawn by CAMACHO *et al.* (1981).

A smaller chromosome number was observed in *Onconotus laxmanni* 2n♂=25 (NF=27). This species is distributed from the steppes of Kazakhstan till to western Siberia, and in all places it is very scarce. The taxonomic position of this species is not clear. TARBINSKII (1932, 1940) suggests that it belongs to a different subfamily. It may be assumed that the chromosome number of this species developed from the basic number by multiple rearrangements connected with Robertsonian and tandem translocations.

Species of the Old World Drymadusini and the New World groups of Platycleidini and Tettigoniini, characterized by one or more pairs of metacentric autosomes and often a metacentric X chromosome, diverge from the basic karyotype. The chromosome numbers of species of Drymadusini range from 31 to 25, and in the North American species even from 31 to 23 in males. The results obtained from the karyological analysis of these species (WARCHAŁOWSKA-ŚLIWA & BUGROV 1996a; UESHIMA & RENTZ 1979), indicate the presence of a more intensive karyotype evolution than that in other genera or tribes of the Old World Tettigoniinae.

Bradyporinae. Up to now, 29 karyotypes (including chromosome races) of 25 species (out of 12 genera), distributed in the South Palearctic area, are described. Three species of *Zichyini* are characterized by 2n♂=31, which is considered as the basic karyotype (WARCHAŁOWSKA-ŚLIWA & BUGROV 1996). Bradyporinae show karyotypes ranging from 31 to 22 (Fig. 1) with an XO or neo-XY sex determination mechanism, the latter occurring only in two species, *Callicrania seoanei* and *Pycnogaster cucullata*. Six species of the genus *Ephippiger*, two species of *Uromenus*, one species of *Deracantha*, and five species of *Pycnogaster* have a karyotype consisting of 2n♂=29(XO) (NF=31), with one pair of metacentric chromosomes. This karyotype originated from a Robertsonian translocation of acrocentric chromosomes. The lower chromosome numbers 2n♂=27, 25, and 23 in this subfamily were formed owing to complex translocations (FERNANDEZ-PIQUERAS *et al.* 1983a; WARCHAŁOWSKA-ŚLIWA & BUGROV 1997).

Four chromosomal races in the genus *Uromenus* (=*Steropleurus*) *mortorelli* with chromosome numbers ranging from 2n♂=29 to 2n♂=23, were decribed by FERNANDEZ-PIQUERAS *et al.* (1983a). The model of speciation of these forms is based on chromosomal rearrangement (centric and tandem fusions), similar to the stasipatric model described by WHITE (1968, 1974, 1978b), although no zones of hybridization have been found in nature.

The evolution of karyotypes of species from this subfamily corresponds to morphological data on the tribe level (GOROCHOV, personal information) (Fig. 2).

Zaprochilinae. Seventeen species of 5 genera from Australia were karyotyped by UESHIMA (1993). According to this author, the 35-karyotype which occurs in three genera is the common chromosome number in this subfamily. In *Phasmodes* there are two different chromosome numbers, 2n=31 (NF=33) and 2n=29 (NF=36), with one or three pairs of matacentric autosomes. The evolution of these karyotypes and their connection with chromosome rearrangements are still not clear. In the genus *Zaprochilus*, three species show probably the basic karyotype with 31 chromosomes in the male.

Meconematinae. Six species out of 4 genera revealed that the chromosome number in each genus was different as 33, 31, and 27, with a common XO/XX sex mechanism. Two Japanese species have the basic chromosome number 2n=31. In other species, one, two, or three pairs are subacro- submeta- or metacentric. The X chromosome is submeta- or metacentric. The parthenogenetic species *Xiphidiopsis lita* is a diploid with 2n=26(XX).

However, discussion about karyotypes in this subfamily is difficult because of the small amount of data.

Conclusions

The frequency of distribution of chromosome numbers in Tettigoniidae, based on currently available data (without species marked

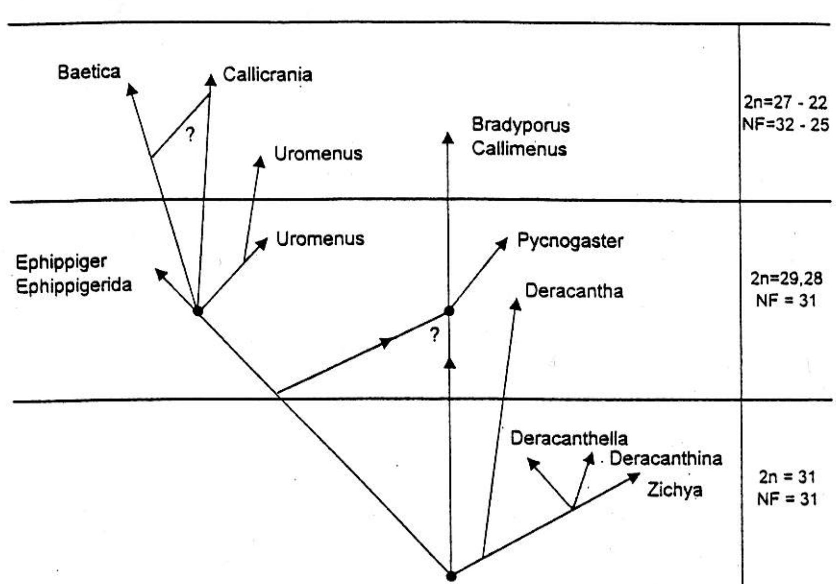


Fig. 2. Scheme of morphological data on the tribe level (Gorochov, personal information) illustrated by the chromosome number (2n) and morphology (NF). Question marks (?) indicate two hypothetic ways of evolution of genera *Pycnogaster* and *Callicrania* lineages.

by asterisk in the Table 1) is shown in Fig. 3. This diagram includes different chromosome numbers corresponding to 390 species (some of them being polymorphic). From this diagram it appears that (1) the group shows a remarkable diversity of chromosome numbers; (2) there is one peak corresponding to 2n♂=31 (belonging to Odonturinae and Tettigoniinae of which many species have this karyotype); (3) the karyotypes 2n♂=32, 30, 28, 26, 22, 20, 16 & 12 are present only in one, two, or three species and are connected with the neo-XY sex determination mechanism.

According to WHITE (1973), it may be assumed that 2n♂=31 and NF =31 is the basic/ancestral number of chromosomes for most species of the subfamilies of Tettigoniidae. Since than the number of karyotyped species increased about 80% and reached 390 species from 147 genera and 15 subfamilies of 22 accepted by GOROCHOV (1995). This karyotype occurs in most species from 12 (out of 15) subfamilies , all of them distributed in the Palearctic, Australian, or American regions. This confirms that the ancestral karyotype included 2n=31, NF= 31. So far, this chromosome number was not found only in representatives of the subfamilies Mecopodinae, Hetrodinae, Nedubinae, and Glyphonotinae. This could indicate either another basic chromosome number, characteristic of this group of subfamilies, which would suggest its separateness, or that the number of species investigated from this viewpoint is too small.

The highest chromosome numbers are rarely present, 2n♂=33 (NF=33, 34, 38, 42) was found in Phaneropterinae in 2 species, in Conocephalinae including Microtettigoniini in 15 species, Meconematinae in 2 species, and in Tettigoniinae in 1 species. 2n=35 (NF=35, 36) in the male, occurs in some species in Pleminiinae, Pseudophyllinae, and Zaprochilinae. However, among the above mentioned subfamilies, there are also species with the basic karyotype 2n=31. Explanation of the presence of chromosome numbers higher than 31, at present seems to be difficult. It also cannot be excluded that in such subfamilies, karyotype evolution in fact began from another chromosome number, higher than 31. For example, such a situation might have been possible in the Australian katydids Zaprochilinae and Microtettigoniini, among which a high degree of endemism exists. One of the possible mechanism of increasing both of chromosome number and NF could be connected with chromosome aneuploidy.

It should also be noted that Australian species from Tettigoniinae are characterized by the occurrence of karyotypes with chromosome numbers smaller than in most species from other geographical regions. The presence of chromosome numbers from 2n♂=21 to 2n=15 (higher numbers were not reported), may indicate another course of evolution in these endemic species. Sometimes endemic species from genera with a stable karyotype, such as, e.g. *Montana* and *Isophya*, found only in rather restricted areas in the Palearctic region, also reveal a distinquishable karyotype evolution connected with smaller chromosome numbers or a different NF.

When searching for certain general tendencies of karyotype evolution in subfamilies more exten-

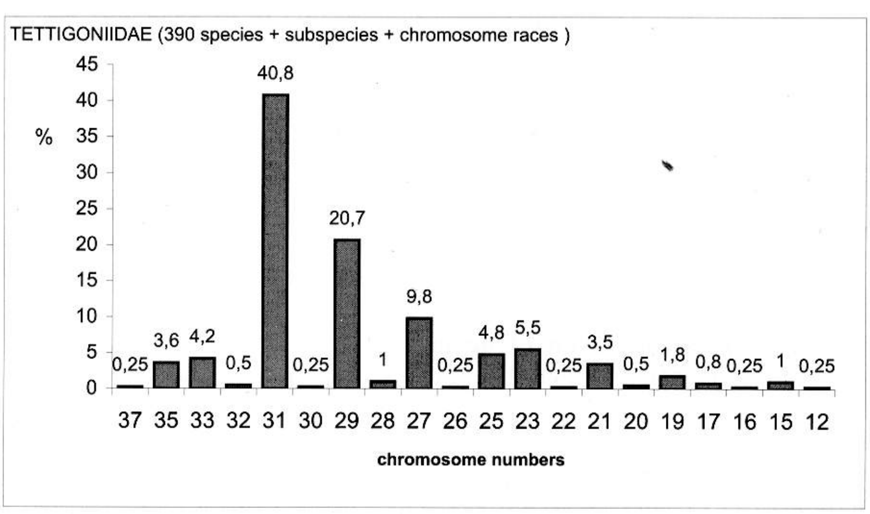


Fig. 3. Histogram showing the frequency distribution of male diploid chromosome numbers in Tettigoniidae (in % of total number of species).

sively investigated from this viewpoint, such as Phaneropterinae, Odonturinae, Tettigoniinae, and Bradyporinae, it appears that changes in chromosome number are usually accompanied by changes in chromosome morphology. The latter may result from one or several types of chromosomal mutations, i.e. mainly from Robertsonian fusion, tandem fusion, and pericentric inversion. In this connection it should be stressed that structural chromosome changes, simultaneously never involve an autosome and the X chromosome, which consequently remains in a state of evolutionary isolation (WHITE 1941).

The data in the present paper allow the following conclusions about pathways at karyotype evolution in Tettigoniidae:

(1) Robertsonian fusions (i.e. fusion between one or more autosomal pairs with distally located centromeres, leading to the formation of biarmed chromosomes), are a common mode of karyotype evolution within Tettigoniinae and Bradyporinae. Differences in chromosome number and morphology among some species or in all species of one genus or several genera of these subfamilies, can be explained by either one, two, or more autosome fusions. An example of the above could be the reduction of the chromosome number of 2n=31 (all of them acrocentric) to 2n=29 (one metacentric pair), with simultaneous retention of the original 31 chromosome arms. This phenomenon was observed in some species of *Metrioptera*, *Pholidoptera* from Tettigoniinae and in *Deracantha*, *Pycnogaster*, *Ephippiger* from Bradyporinae. Reduction of the chromosome number to 2n=27 (with two metacentric pairs) was observed, e.g., in *Ectopisdectes* from Micritettigoniini. The closest chromosome number in relation to the basic 2n=29 was found in about 20% of the investigated species. In this case the size of the metacentric pair of chromosomes indicates a translocation of the first and second pairs of chromosomes of the basic karyotype with 2n=31. An example of such a translocation are representatives of the subfamily Bradyporinae. Analysis based on C-banding techniques shows independent development of such a karyotype, as a step in the structural evolution of karyotypes in each phylogenetic group.

(2) Tandem fusions (being the result of an interchange between acrocentric pairs, without change in position of the centromere, result from one break in the vicinity of the centromere in one chromosome, and another break near the chromosome end, in the second) are exhibited in the evolutionary pathways of Phaneropterinae, Odonturinae and, probably, Hetrodinae. An example of such a translocation is the development of neo-XY sex determination in *Isophya hemiptera*. This is the only known case in Orthoptera in which the neo-X pattern was produced by tandem fusion of the autosome to the interstitial part of the original acrocentric X chromosome and loss of the centromere region with a C-block. This translocation produced an acrocentric neo-X, combining the original X with one of the autosomes (XR), the homologous one becoming the acrocentric neo-Y chromosome (WARCHAŁOWSKA-ŚLIWA & BUGROV 1998).

(3) Pericentric inversions (centric shifts) change the morphology of the X chromosome. This can be observed in subfamilies where the chromosome number is 2n=31 but NF=32, whereas the X chromosome has two arms (subacro/submeta/metacentric) as, e.g., in three species of the genus *Isophya* and *Poecilimon laevissimus* (Odonturinae); *Montana alexandra* and *Gampsocleis ryukyuensis* (Tettigoniinae).

(4) Sometimes autosome fusion (Robertsonian and tandem fusion) and paracentric inversion can occur together in the same taxa: e.g., eight species of Drymadusini (Tettigoniinae) (WARCHAŁOWSKA-ŚLIWA & BUGROV 1996), and eight species (including one subspecies) of the genus *Gampsocleis* (WARCHAŁOWSKA-ŚLIWA 1984b; WARCHAŁOWSKA-ŚLIWA *et al.* 1992b; present paper) display a more intensive karyotype evolution.

Chromosome numbers, the position of the centromere, and the sex determination mechanism are only basic information about the karyotype and visualize only a small proportion of possible chromosome rearrangements.

One may expect that further analysis of the chromosomes of Tettigoniidae, i.e. of their length, supernumerary segments, chiasma formation, and banding (by C-banding and Ag-staining techniques), will be gradually extended, permitting finally the identification of individual chromosomes. Thus, evolutionary relationships among individuals, populations, and species in some subfamilies, mainly, Odonturinae and Tettigoniinae, will be analysed in the next publication (in preparation).

The author hopes that the presented characteristics of karyotypes of Tettigoniidae will be helpful in further studies on the phylogenesis of this group.

Acknowledgements

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Number and morphology of chromosomes in Tettigoniidae

Taxa	Collection locality	2n ♂	Sex det.♂	NF	Chromosome morphology	References
Phaneropterinae						
**Amblycorypha rotundifolia* (Scudder, 1862)	USA	33*	XO	34	L_1-S_{16} acro?; X meta/submeta	PEARSON 1929 (see MAKINO 1951)
Amblycorypha oblongifolia (De Geer, 1773)	USA	33*	XO	34	L_1-S_{16} acro; X meta/submeta	PEARSON 1929 (see MAKINO 1951)
	Canada	31	XO	32	L_1-S_{15} acro; X submeta	BEAUDRY 1973
Stilpnochlora azteca (Saussure, 1859)	Mexico	33	XO	33	all acro	CISNEROS-BARRIOS *et al.* 1990
Stilpnochlora quadrata (Scudder, 1869)	Mexico	33	XO	33	all acro	CISNEROS-BARRIOS *et al.* 1990
Stilpnochlora marginella (Servile, 1839)	Brazil?	31	XO	–	all acro?	PIZA 1945 (see MAKINO 1951)
Isopsera sp.	India	32	neo-XY	33	L_1-S_{15},Y acro; X meta	DAVE 1965
Anaulacomera dimidiata Piza (data unknown)	Brazil	31	XO	32	L_1-S_{15} acro; X meta	FERREIRA 1977
Anaulacomera horti Piza, 1975	Brazil	31	XO	32	L_1-S_{15} acro; X meta	FERREIRA 1977
Anaulacomera sp.1	Brazil	31	XO	32	L_1-S_{15} acro; X meta	FERREIRA 1977
Anaulacomera sp.2	Brazil	31	XO	32	L_1-S_{15} acro; X meta	FERREIRA 1977
Anaulacomera sp.	Brazil	31	XO	–	–	PIZA 1945 (see MAKINO 1951)
Chloroscirtus forcipatus (Brunner von Wattenwyl, 1878)	Mexico	31	XO	31	all acro	CISNEROS-BARRIOS *et al.* 1990
Diplophyllus acreanus Piza (data unknown)	Brazil	31	XO	31	all acro	FERREIRA 1977
Dysonia elegans (Brunner von Wattenwyl, 1878)	Brazil	31	XO	31	all acro	FERREIRA 1977
Euceraia insignis Hebard, 1926	Brazil	31	XO	31	all acro	FERREIRA 1976
Himertula kinneari (Uvarov, 1923)	India	31	XO	31	all acro	ASWATHANARAYANA, ASWATH 1996 (as *Himerta kinneari*)

Himertula sp.	India	31	XO	31	all acro	ASWATHANARAYANA, ASWATH 1996 (as *Himerta* sp.)
Holochlora japonica Brunner von Wattenwyl, 1878	Japan	31	XO	31	all acro	OHMACHI 1935 (see ASANA *et al.* 1938); HAREYAMA 1941 (see MAKINO 1951)
	S. Korea	31	XO	31	all acro	present paper
Holochlora spectabilis Walker, 1869	India	29	XO	29	all acro	ASWATHANARAYANA, ASWATH 1996
Holochlora sp.	India	31	XO	31	all acro	ASANA *et al.* 1938
Hyperophora angustipennis Brunner von Wattenwyl, 1891	Brasil	31	XO	31	all acro	FERREIRA 1976
Insara gracillima (Brunner von Wattenwyl, 1878)	Mexico	31	XO	31	all acro	WHITE 1941
Insara tolteca (Saussure, 1859)	Mexico	31	XO	31	all acro	WHITE 1941
Ischyra punctinervis Brunner von Wattenwyl, 1878	Brazil	31	XO	31	all acro	PIZA 1950b
Microcentrum bicentenaria (Piza, 1968)	Brazil	31	XO	31	all acro	FERREIRA 1976 (as *Parableta bicentenaria*)
Microcentrum lanceolatum (Burmeister, 1839)	Brazil	31	XO	31	all acro	FERREIRA 1976
Microcentrum myrtifolium Saussure & Picket, 1898	Mexico	31	XO	31	all acro	CISNEROS-BARRIOS *et al.* 1990
Microcentrum sp.	Mexico	31	XO	31	all acro	WHITE 1941
**Microcentrum* sp.	USA	33*	XO	33*	all acro	MC CLUNG 1902 (see ASSANA *et al.* 1938)
Parableta affinis Piza, 1950	Brazil	31	XO	31	all acro	FERREIRA 1976
Pararota ferrerai Piza (data unknown)	Brazil	31	XO	31	all acro	FERREIRA 1976
Philophyllia guttulata Stal, 1873	Brazil	31	XO	31	all acro	FERREIRA 1977; PIZA 1950b
Pycnopalpa bicordata (Serville, 1825)	Brazil	31	XO	31	all acro	FERREIRA 1976
Scudderia curvicauda (De Geer, 1773)	Canada	31	XO	31	all acro	BEAUDRY 1973
Scudderia furcata furcata Brunner von Wattenwyl, 1878	Canada	31	XO	31	all acro	BEAUDRY 1973
Scudderia texensis Saussure & Pictet, 1897	Canada	31	XO	31	all acro	BEAUDRY 1973
Scudderia pistillata Brunner von Wattenwyl, 1878	Canada	29	XO	29	all acro	BEAUDRY 1973
**Scudderia* sp.	USA?	33*	XO	33	all acro	MC CLUNG 1902, 1914 (see MAKINO 1951)
	Brazil	31	XO	31	all acro	PIZA 1945 (see MAKINO 1951)
Topana aquilari Piza, 1972	Brazil	31	XO	31	all acro	FERREIRA 1976, 1977

Tylopsis lilifolia (Fabricius, 1793)	Italy	31	XO	31	all acro	MESSINA *et al.* 1975; WARCHAŁOWSKA-ŚLIWA *et al.* 1996
Theudoria malanocnemis (Stal, 1860)	S. Am.	30	neo-XY	31	L_1-S_{14},Y acro; X meta	WHITE *et al.* 1967
Ducetia japonica (Thunberg, 1815)	Japan	27	XO	–	all acro?	HAREYAMA 1937 (see ASANA *et al.* 1938)
	India	29	XO	29	all acro	ASANA *et al.* 1938
	Japan	29	XO	–	–	HAREYAMA 1937, 1939, 1941 (see MAKINO 1951)
Kuwayamaea sapporensis (Matsumura & Shiraki, 1908)	Japan	27	XO	–	all acro?	HAREYAMA 1937, 1939, 1941 (see MAKINO 1951)
Elimaea fallax Bey-Bienko, 1951	N. Korea	29	XO	29	all acro	present paper
Elimea sp.	Japan?	29	XO	–	–	MOMMA 1941 (see MAKINO 1951)
Elimaea securigera Brunner von Wattenwyl, 1878	India	27	XO	28	L_1-S_{13} acro; X subacro	ASANA 1931; ASANA *et al.* 1938
	India	25	XO	28	L_1 meta; M_2-S_{12} acro; X submeta	MUTHU 1987, 1988 (as *Elimaea diversa*)
	India	27	XO	27	all acro; "variant karyotype"	ASWATHANARAYANA, SRINIVASA 1993
Letana nigrosparsa (Walker, 1871)	India	29	XO	29	all acro, variant S_8 subacro	ASWATHANARAYANA 1996
Letana atomifera (Brunner von Wattenwyl, 1878)	India	27	neo-X_1X_2Y	29	L_1-S_{12}, X_2acro; X_1 submeta; Y meta	DAVE 1965
Mendesius albosignatus Piza (data unknown)	Brazil	28	neo-XY	29	L_1-S_{13},Y acro; X submeta	FERREIRA 1976
Pelerinus alienus (Brunner von Wattenwyl, 1878)	India	29	XO	29	all acro	KUMARASWAMY, RAJASEKARASETTY 1979 (as *Allodapia aliena*)
Phaneropterops piracicabensis Piza, 1971	Brazil	29	XO	29	all acro	FERREIRA 1977
Viadana longicercata (Brunner von Wattenwyl, 1891)	Brazil	29	XO	29	all acro	FERREIRA 1977
Anisotima japonica (Matsumura & Shiraki,1908)	Japan	27	XO	28	L_1-S_{13} acro; X meta	HAREYAMA 1937 (see ASANA *et al.*1938) (as *Isotima japonica*)
**Phaneroptera exigua* Piza (data unknown)	Brazil	31	XO	31	all acro	FERREIRA 1976
Phaneroptera falcata (Poda, 1761)	Japan	27	XO	27	all acro	HAREYAMA 1937,1939,1941; MOMMA 1941 (see MAKINO 1951); MORITA 1929
	Poland	27	XO	27	all acro	WARCHAŁOWSKA-ŚLIWA 1984a

Phaneroptera nigroantennata Brunner von Wattenwyl, 1878	N. Korea	27	XO	27	all acro	present paper
	Japan	25*	XO	–	–	OHMACHI 1943 (see MAKINO 1951) (as *Phaneroptera nakanoensis*)
	Japan	27	XO	–	–	HAREYAMA 1948 (see MAKINO 1951) (as *Phaneroptera nakanoensis*)
Phaneroptera nana nana Fieber, 1853	Italy	27	XO	27	all acro	MESSINA *et al.* 1975; WARCHAŁOWSKA-ŚLIWA *et al.* 1996
**Phaneroptera quinquisignata* Piza (data unknown)	Brazil	29	XO	30	L_1-S_{14}acro; X meta	FERREIRA 1977
		29	XO	31	"variant karyotype":1M meta	FERREIRA 1977
Cnemidophyllum (*Eupeucestes*) *citrifolium* Linnaeus, 1758	Brazil	25	XO	25	all acro	FERREIRA 1977; PIZA 1950 (as *Posidippus citrifolius*)
Phrixa nasuta Stal, 1874	Mexico	25	XO	25	all acro	CISNEROS-BARRIOS *et al.* 1990
Tinzeda albosignata (Brunner von Wattenwyl, 1878)	Australia	25	XO	25	all acro	FERREIRA 1969
Caedicia marginata Brunner von Wattenwyl, 1878	Australia	20	neo-XY	21	L_1-S_9, Y acro; X meta	FERREIRA 1969
Caedicia sp. a	Australia	21	XO	21	all acro	FERREIRA 1969
Caedicia sp. b	Australia	21	XO	21	all acro	FERREIRA 1969
Caedicia sp. c	Australia	21	XO	21	all acro	FERREIRA 1969
Dichopetala brevihastata Morse, 1902	Mexico	23	XO	23	all acro	MESA, FERREIRA 1977b
Dichopetala tauriformis Rehn & Hebard, 1914	Mexico	23	XO	–	–	CISNEROS-BARRIOS *et al.* 1990
	India?	27	XO	28	L_1-S_{13} acro; X submeta	MUTHU 1987, 1988
Dichopetala femorata (data unknown)	Mexico	17	XO	–	–	CISNEROS-BARRIOS *et al.* 1990
Dichopetala mexicana Brunner von Wattenwyl, 1878	Mexico	17	XO	–	–	CISNEROS-BARRIOS *et al.* 1990
Polichne parvicauda (Stal, 1860)	Australia	21	XO	21	all acro	FERREIRA 1969
		16	neo-XY	21	L_1, M_2, X meta; M_3-S_7 acro	FERREIRA 1969
Torbia viridissima Brunner von Wattenwyl, 1878	Australia	19	XO	19	all acro	FERREIRA 1969
Trigonocorypha unicolor (Stoll, 1787)	India	29	XO	–	–	KACKER, SINGH 1976
	India	19	XO	–	1 or 2 pairs meta, X meta, rest acro	DASGUPTA 1961 (as *Trigonomorpha crenulata*)
Itarissa sp.	Brazil	17	XO	21	L_1,M_2 submeta; M_3-S_8, X acro	FERREIRA 1977 (as *Prosagoga* sp.)

Odonturinae (= Barbitistini)

Ancistrura nigrovittata (Brunner von Wattenwyl, 1878)	Bulgaria	31	XO	31	all acro	WARCHAŁOWSKA-ŚLIWA *et al.* 1987
Andreiniimon nuptialis (Karny, 1918)	Greece	31	XO	31	all acro	WARCHAŁOWSKA-ŚLIWA, HELLER 1998
Barbitistes constrictus Brunner von Wattenwyl, 1878	Poland	31	XO	31	all acro	WARCHAŁOWSKA-ŚLIWA 1984a
Barbitistes serricauda (Fabricius, 1798)	Hercegovina	32	neo-XY	32	all acro	MESSINA *et al.* 1975
Isophya altaica (Bey-Bienko, 1926)	Rus-Alt	31	XO	32	L_1-S_{15} acro; X subacro	WARCHAŁOWSKA-ŚLIWA *et al.* 1996
Isophya brevipennis Brunner von Wattenwyl, 1878	Poland	31	XO	32	L_1-S_{15} acro; X subacro	WARCHAŁOWSKA-ŚLIWA, MARYAŃSKA-NADACHOWSKA 1992
Isophya hemiptera Bey-Bienko, 1954	Rus-NCau	30	neo-XY	30	all acro	WARCHAŁOWSKA-ŚLIWA, BUGROV 1998
Isophya kalishevskii Adelung, 1907	Rus-NCau	31	XO	31	all acro	WARCHAŁOWSKA-ŚLIWA, BUGROV 1998
Isophya kraussii Brunner von Wattenwyl, 1878	Germany	31	XO	32	L_1-S_{15} acro; X subacro/submeta	WARCHAŁOWSKA-ŚLIWA, HELLER 1998
Isophya rectipennis Brunner von Wattenwyl, 1878	Bulgaria	31	XO	31	all acro	WARCHAŁOWSKA-ŚLIWA *et al.* 1996
Isophya schneideri Brunner von Wattenwyl, 1878	Rus-NCau	31	XO	31	all acro	WARCHAŁOWSKA-ŚLIWA *et al.* 1995
Isophya speciosa (Frivaldsky, 1865)	Europe	31	XO	31	all acro	MANOLACHE, VARO 1987
Leptophyes albovittata (Kollar, 1833)	Poland	29	XO	29	all acro	WARCHAŁOWSKA-ŚLIWA 1984a
Leptophyes boscii Fieber, 1853	Italy	29	XO	29	all acro	MESSINA *et al.* 1975
Leptophyes laticauda (Frivaldsky, 1867)	Italy	31	XO	31	all acro	WARCHAŁOWSKA-ŚLIWA, HELLER 1998
Leptophyes punctatissima (Bosc, 1792)	–	32	partheno.	32	all acro	BAILLON 1939
	Norway	31	XO	31	all acro	MOHR 1917
	Lab. culture	31	XO	32	L_1-S_{15} acro; X subacro/submeta	WARCHAŁOWSKA-ŚLIWA, HELLER 1998
Metaplastes ornatus (Ramme, 1931)	Greece	31	XO	31	all acro	WARCHAŁOWSKA-ŚLIWA, HELLER 1998
Poecilimon ampliatus Brunner von Wattenwyl, 1878	Hercegovina	31	XO	31	all acro	MESSINA *et al.* 1975
Poecilimon artedentatus Heller, 1984	Greece	31	XO	31	all acro	present paper
Poecilimon brunneri (Frivaldsky, 1867)	Bulgaria	31	XO	31	all acro	WARCHAŁOWSKA-ŚLIWA *et al.* 1992a
Poecilimon chopardi Ramme, 1933	Greece	31	XO	31	all acro	present paper
Poecilimon heroicus Shchelkanovtsev, 1911	Rus-NCau	31	XO	31	all acro	WARCHAŁOWSKA-ŚLIWA *et al.* 1995
Poecilimon hoelzeli (Harz, 1966)	Greece	31	XO	31	all acro	present paper
Poecilimon intermedius (Fieber, 1853)	Rus-Sib	32	partheno.	32	all acro	WARCHAŁOWSKA-ŚLIWA *et al.* 1996
Poecilimon jonicus tessellatus (Fieber, 1853)	Greece	31	XO	31	all acro	present paper

Poecilimon laevissimus (Fischer-Waldheim, 1853)	Italy	31	XO	32	L1-S15 acro; X subacro	MESSINA *et al.* 1975
Poecilimon mariannae Willemse & Heller, 1992	Greece	31	XO	31	all acro	present paper
Poecilimon nobilis (Brunner von Wattenwyl, 1878)	Greece	31	XO	31	all acro	present paper
Poecilimon ornatus (Schmidt, 1850)	Italy	31	XO	31	all acro	present paper
Poecilimon propinquus Brunner von Wattenwyl, 1878	Greece	31	XO	31	all acro	present paper
Poecilimon schmidtii (Fieber, 1853)	Bulgaria	31	XO	31	all acro	present paper
Poecilimon scythicus Shchelkanovtsev, 1911	Rus-NCau	31	XO	31	all acro	WARCHAŁOWSKA-ŚLIWA *et al.* 1995
Poecilimon superbus (Fischer-Waldheim, 1853)	Italy	31	XO	31	all acro	MESSINA *et al.* 1975
Poecilimon thessalicus Brunner von Wattenwyl, 1891	Greece	31	XO	31	all acro	present paper
Poecilimon thoracicus (Fieber, 1853)	Bulgaria	31	XO	31	all acro	WARCHAŁOWSKA-ŚLIWA *et al.* 1966
Poecilimon ukrainicus Bey-Bienko, 1951	Poland	31	XO	31	all acro	WARCHAŁOWSKA-ŚLIWA, BUGROV 1998
Poecilimon unispinosus Brunner von Wattenwyl, 1878	Greece	31	XO	31	all acro	present paper
Poecilimon zimmeri Ramme, 1933	Greece	31	XO	31	all acro	present paper
Poecilimon zwicki Ramme, 1939	Bulgaria	31	XO	31	all acro	WARCHAŁOWSKA-ŚLIWA *et al.* 1992a
Poecilimon veluchianus veluchianus Ramme, 1933	Greece	31	XO	31	all acro	present paper
Poecilimon veluchianus minor Heller & Reinhold, 1993	Greece	31	XO	31	all acro	present paper
Polysarcus denticauda (Charpentier, 1825)	–	31	XO	31	all acro	SINETY DE 1901 (see ASANA *et al.* 1938) (as *Orphania denticauda*)
Polysarcus zacharovi Shchelkanovtzev, 1910	Rus-NCau	31	XO	31	all acro	WARCHAŁOWSKA-ŚLIWA, BUGROV 1998
Odontura arcuata Messina, 1981	Italy	28	neo-XY	28	all acro	MESSINA 1981
Odontura stenoxypha (Fieber, 1853)	Italy	28	neo-XY	29	L_1-S_{13}, Y acro; X subacro	ALICATA *et al.* 1974; MESSINA 1981
		28	neo-XY	28	L_1-S_{13}, Y, X acro	ALICATA *et al.* 1974
Odontura calaritana Costa, 1883	Italy	27	XO	27	all acro	MESSINA 1981
Odontura maroccana Bolivar, 1908	Morocco	27	XO	27	all acro	MATTHEY 1948b
Mecopodinae						
Mecopoda elongata Linnaeus, 1758	India	27	XO	32	L_1,L_2, X submeta; M_3-S_{13} acro	ASANA *et al.* 1938
	India	29	XO	56	L_1,S_4-S_{10}, X meta; L_2,M_3-S_{11}-S_{13} subacro; S_{14} acro	ASWATHANARAYANA, ASWATH 1994
Mecopoda nipponensis (De Haan, 1842)	Japan	27	XO	–	L_1-S_{13} acro ?; X meta	HAREYAMA 1932b (see ASANA *et al.* 1938)
Mecopoda sp.	India	27	XO	54	L_1,S_4-S_{10}, X meta; L_2,M_3,S_{11-13} subacro	ASWATHANARAYANA, ASWATH 1994

Pseudophyllinae						
Phyllozelus pectinatus (data unknown)	India	35	XO	36	L_1-S_{14} acro; X meta	ASWATHANARAYANA, ASWATH 1996
Sathrophyllia femorata (Fabricius, 1787)	India	36	XX♀	36	all acro	ASWATHANARAYANA, ASWATH 1996
Sathrophyllia sp.	India	35	XO	35	all acro	ASANA *et al.* 1938
Sathrophyllia rugosa (Thunberg, 1815)	India	31	XO	31	all acro	YADAV, YADAV 1986
Pleminiinae						
Jamaicana flava Caudell, 1914	C. Am.	35	XO	35	all acro	WOOLSEY 1915 (see MAKINO 1951)
Jamaicana unicolor Brunner von Wattenwyl, 1895	C. Am.	33	XO	33	all acro	WOOLSEY 1915 (see MAKINO 1951)
Jamaicana subguttata (Walker, 1870)	C. Am.	34	XX♀	34	all acro	WOOLSEY 1915 (see MAKINO 1951)
Meroncidius intermedius Brunner von Wattenwel, 1895	S. Am.	31	XO	35	2p. meta; 13p., X acro	PIZA 1950a (see HEWITT 1979)
Saginae						
* *Saga cappadocica* Werner, 1903	–	31	XO	–	–	MATTHEY 1950 (see MAKINO 1951)
Saga hellenica Kaltenbach, 1967	Greece	29	XO	32	L_1, X meta; M_2-S_{14} acro	present paper
* *Saga ephippigera* Fischer-Waldheim, 1846	Palestyna	31	XO	32	L_1-S_{16} acro; X meta	MATTHEY 1946, 1948a,b; GOLDSCHMIDT 1946
	Morocco	33*	XO	34	L_1-S_{16} acro; X meta	MATTHEY 1948b
* *Saga ornata* Burmeister, 1838	Palestyna	31	XO	32	L_1-S_{15} acro; X meta	MATTHEY 1946; GOLDSCHMIDT 1946 (as *Saga gracilipes* Uvarov)
	Morocco?	31	XO	32	L_1-S_{15} acro; X meta	MATTHEY 1948a,b
* *Saga pedo* (Pallas, 1771)	Switzerland	68	partheno.	tetra	L_1,L_2, X meta; rest acro	MATTHEY 1941, 1946
Austrosaginae						
Hemisaga albilinea Rentz, 1993	Australia	31	XO	31	all acro	UESHIMA 1993
Hemisaga allirra Rentz, 1993	Australia	31	XO	31	all acro	UESHIMA 1993
Hemisaga baileyi Rentz, 1993	Australia	31	XO	31	all acro	UESHIMA 1993
Hemisaga denticulata (White, 1841)	Australia	31	XO	31	all acro	UESHIMA 1993
Hemisaga lanceolata Ander, 1957	Australia	31	XO	31	all acro	UESHIMA 1993
Hemisaga lunodonta Rentz, 1993	Australia	31	XO	31	all acro	UESHIMA 1993
Hemisaga mullaya Rentz, 1993	Australia	31	XO	31	all acro	UESHIMA 1993
Hemisaga pericalles Rentz, 1993	Australia	31	XO	31	all acro	UESHIMA 1993

Hemisaga saussurei Brancsik, 1895	Australia	31	XO	31	all acro	UESHIMA 1993
Hemisaga undulata Rentz, 1993	Australia	31	XO	31	all acro	UESHIMA 1993
Hemisaga venator Rentz, 1993	Australia	31	XO	31	all acro	UESHIMA 1993
Sciarasaga quadrata Rentz, 1993	Australia	31	XO	31	all acro	UESHIMA 1993
Pachysaga australis (Walker, 1869)	Australia	31	XO	31	all acro	UESHIMA 1993
Pachysaga croceopteryx Rentz, 1993	Australia	31	XO	31	all acro	UESHIMA 1993
Pachysaga eneabba Rentz, 1993	Australia	31	XO	31	all acro	UESHIMA 1993
Pachysaga munggai Rentz, 1993	Australia	31	XO	31	all acro	UESHIMA 1993
Pachysaga ocrocercus Rentz, 1993	Australia	31	XO	31	all acro	UESHIMA 1993
Psacadonotus insulanus Rentz, 1993	Australia	31	XO	31	all acro	UESHIMA 1993
Psacadonotus robustus Rentz, 1993	Australia	31	XO	31	all acro	UESHIMA 1993
Psacadonotus kenkulun Rentz, 1993	Australia	29	XO	30	L_1-S_{14} acro; X meta	UESHIMA 1993
Psacadonotus psithyros Rentz, 1993	Australia	29	XO	30	L_1-S_{14} acro; X meta	UESHIMA 1993
Psacadonotus viridis Rentz, 1993	Australia	29	XO	30	L_1-S_{14} acro; X meta	UESHIMA 1993
Hetrodinae						
Eugaster fernandezi Graells, 1878	Morocco	29	XO	29	all acro	MATTHEY 1948b
Eugaster guyoni Serville, 1839	Morocco	29	XO	29	all acro	FAVRELLE 1936
Eugaster spinulosa (Linnaeus, 1764)	Morocco	29	XO	29	all acro	MATTHEY 1948 (as *Eugaster spinulosus*)
Conocephalinae						
Conocephalus longipennis (Hann, 1842)	–	33	XO	–	–	OHMACHI 1939 (see MAKINO 1951) (as *Xiphidion longipennis*)
Conocephalus japonicus (Redtenbacher, 1981)	Japan	33	XO	–	–	OHMACHI 1939 (see MAKINO 1951) (as *Xiphidion japonicum*)
Conocephalus chinensis (Redtenbacher, 1891)	Japan	33	XO	–	–	HAREYAMA 1939, 1941 (see MAKINO 1951) (as *Xiphidion chinesis*)
Conocephalus discolor Thunberg, 1815	Poland	33	XO	42	L_1,L_2 submeta; M_4,M_{10}, X meta; M_3,M_5-M_9,S_{11}-S_{16} acro	WARCHAŁOWSKA-ŚLIWA 1984a
Conocephalus dorsalis (Latereille, 1804)	Poland	33	XO	42 –	L_1,L_2 submeta; M_4,M_{10}, X meta; M_3,M_5-M_9,S_{11}-S_{16} acro	WARCHAŁOWSKA-ŚLIWA 1984a

Conocephalus fasciatus De Geer, 1773	America	33	XO	–	autos.?; X meta	MC CLUNG 1908 (see ASANA *et al.* 1938) (as *Xiphidion fasciatus*)
Conocephalus gladiatus Radtenbacher, 1891	S. Korea	31	XO	–	–	DOUK HOON *et al.* 1987
	Japan	33	XO	–	autos.?; X meta	OHMACHI, SOKAME 1935 (see ASANA *et al.* 1938) (as *Xiphidion gladiatum*)
						HAREYAMA 1939, 1941 (see MAKINO 1951)
Conocephalus melanum Hann, 1842	–	33	XO	–	all acro	HAREYAMA 1932b, 1941 (see ASANA *et al.* 1938)
						OHMACHI 1939 (see MAKINO 1951) (as *Xiphidion melanum*)
Conocephalus sp.	India	33	XO	38	L_1,L_2, X meta; M_3-S_{16} acro	ASANA *et al.* 1938
Orchelimum concinnum Scudder, 1862	N. Am.	33	XO	–	autos.?; X meta	KING 1924 (see MAKINO 1951)
Orchelimum vulgare Harris, 1841	N. Am.	33	XO	–	autos.?; X meta	KING 1924 (see MAKINO 1951)
Hexacentrus japonica hareyamai Furukawa, 1941	Japan	33	XO	–	autos.?; X acro/subacro	HAREYAMA 1937, 1939, 1941 (see ASANA *et al.* 1938; MAKINO 1951)
Hexacentrus unicolor Serville, 1831	Korea	32♀	XX	34	L_1-S_{15} acro; X meta	present paper
Hexacentrus japonicus Karny, 1907	Japan	31	XO	–	–	HAREYAMA 1941 (see MAKINO 1951):
Hexacentrus mundus (Caudell, 1927)	India	31	XO	32	L_1-S_{15} acro; X submeta	ASANA *et al.* 1938
	India	31	XO	32	L_1.S_{15} acro; X submeta	ASANA *et al.* 1938 (as *Hexacentrus annulicornis* Stal)
Anelytra sp.	Australia	29	XO	32	L_1, X meta; M_2-S_{14} acro	FERREIRA 1969
Genus A. sp. A	Australia	29	XO	32	L_1, X meta; M_2-S_{14} acro	FERREIRA 1969
Oxyprora flavicornis Radtenbacher, 1891	S. Am.	29	XO	–	all acro?	PIZA 1950a (see HEWITT 1979)
Pseudorhynchus japonicus Shiraki, 1930	Japan	29	XO	32	L_1 meta; M_2-S_{14} acro; X submeta	UESHIMA 1986
Xesthophrys horvathi Bolivar, 1905	Japan	29	XO	32	L_1 meta; M_2-S_{14} acro; X submeta	UESHIMA 1986
Euconocephalus incertus (Walker, 1891)	India	21	XO	30	L_1,M_3, X meta; L_2,M_4 submeta; M_5-S_{10}acro	KUMARASWAMY, RAJASEKARASETTY 1976
	India	25	XO	30	2 pairs, X meta; rest acro	CHATTERJEE 1976 (see UESHIMA 1986)

Euconocephalus nasutus Thunberg, 1815	Japan	21	XO	30	4 pairs, X meta; rest acro	HAREYAMA 1937, 1939; MOMMA 1941 (see UESHIMA 1986)
Euconocephalus pallidus (Radtenbacher, 1891)	Japan	21	XO	28	L_1,L_2, X meta; M_4 submeta; M_5-S_{10} acro	UESHIMA 1986; HAREYAMA 1939, 1941 (see MAKINO 1951)
Euconocephalus varius (Walker, 1869)	Japan	21	XO	30	4 pairs, X meta; rest acro	HAREYAMA 1937, 1939; MOMMA 1941 (see UESHIMA 1986)
Neoconocephalus infuscatus (Scudder, 1875)	S. Am.	27	XO	–	–	PIZA 1950a (see UESHIMA 1986) (as *Conocephalus infuscatus*)
Neoconocephalus sp.	Mexico	23	XO	32	L_1-M_4, X meta; M_5-S_{11} acro	WHITE 1941
Ruspolia lineosus (Walker, 1869)	Japan	25	XO	–	autos.?; X meta	HAREYAMA 1932b; OHMACHI 1935 (see ASANA *et al.* 1938) (as *Homorocoryphus lineosus*)
Ruspolia nitidula (Scopoli, 1786)	Italy?	21	XO	–	–	TORELLI 1940 (see UESHIMA 1986) (as *Homorocoryphus nitidulus*)
Microtettigoniini						
Glenbalodectes amaroo Rentz, 1985	Australia	33	XO	33	all acro	UESHIMA, RENTZ 1990
Glenbalodectes narraga Rentz, 1985	Australia	33	XO	33	all acro	UESHIMA, RENTZ 1990
Glenbalodectes norrisi Rentz, 1985	Australia	33	XO	33	all acro	UESHIMA, RENTZ 1990
Xederra barbarae Rentz, 1985	Australia	33	XO	33	all acro	UESHIMA, RENTZ 1990
Antipodectes brevicaudus Rentz, 1985	Australia	31	XO	31	all acro	UESHIMA, RENTZ 1990
Antipodectes giganteus Rentz, 1985	Australia	31	XO	31	all acro	UESHIMA, RENTZ 1990
Antipodectes graminicolus Rentz, 1985	Australia	29	XO	31	L_1 meta; M_2-S_{15}, X acro	UESHIMA, RENTZ 1990
Rhachidorus blackdownensis Rentz, 1985	Australia	31	XO	31	all acro	UESHIMA, RENTZ 1990
Rhachidorus longipennis Rentz, 1985	Australia	31	XO	31	all acro	UESHIMA, RENTZ 1990
Rhachidorus semoni Krauss, 1902	Australia	31	XO	31	all acro	UESHIMA, RENTZ 1990
Dexerra acanthiterga Rentz, 1985	Australia	29	XO	29	all acro	UESHIMA, RENTZ 1990
Dexerra serrata Rentz, 1985	Australia	29	XO	29	all acro	UESHIMA, RENTZ 1990
Dexerra turpis Walker, 1869	Australia	29	XO	29	all acro	UESHIMA, RENTZ 1990
Dexerra vigescens Rentz, 1985	Australia	29	XO	29	all acro	UESHIMA, RENTZ 1990

Oligodectoides tindalei Rentz, 1985	Australia	29	XO	29	all acro	Ueshima, Rentz 1990
Oligodectes mallee Rentz, 1985	Australia	29	XO	29	all acro	Ueshima, Rentz 1990
Oligodectes pallens Rentz, 1985	Australia	29	XO	29	all acro	Ueshima, Rentz 1990
Oligodectes longicerus Rentz, 1985	Australia	21	XO	21	all acro	Ueshima, Rentz 1990
Chinandectes neenan Rentz, 1985	Australia	29	XO	29	all acro	Ueshima, Rentz 1990
Chlorodectes loquax Rentz, 1985	Australia	27	XO	30	L_1, X meta; M_2-S_{13} acro	Ueshima, Rentz 1990
Chlorodectes baldersoni Rentz, 1985	Australia	25	XO	28	L_1, X meta; M_2-S_{12} acro	Ueshima, Rentz 1990
Chlorodectes montanus Rentz, 1985	Australia	25	XO	28	L_1, X meta; M_2-S_{12} acro	Ueshima, Rentz 1990
Chlorodectes ligaenus Rentz, 1985	Australia	23	XO	26	L_1, X meta; M_2-S_{11} acro	Ueshima, Rentz 1990
Ectopistidectes daptes Rentz, 1985	Australia	27	XO	31	L_1,L_2 meta; M_3-S_{13}, X acro	Ueshima, Rentz 1990
Ectopistidectes viridis Rentz, 1985	Australia	27	XO	31	L_1,L_2 meta; M3-S_{13}, X acro	Ueshima, Rentz 1990
Metaballus alatus Rentz, 1985	Australia	27	XO	27	all acro	Ueshima, Rentz 1990
Metaballus brevipennis Rentz, 1985	Australia	27	XO	27	all acro	Ueshima, Rentz 1990
Metaballus bynoei Rentz, 1985	Australia	27	XO	27	all acro	Ueshima, Rentz 1990
Metaballus dectiocoides (Walker, 1869)	Australia	27	XO	27	all acro	Ueshima, Rentz 1990
Metaballus frontalis (Walker, 1869)	Australia	27	XO	27	all acro	Ueshima, Rentz 1990
Metaballus litus Rentz, 1985	Australia	27	XO	27	all acro	Ueshima, Rentz 1990
Metaballus mesopterus Rentz, 1985	Australia	27	XO	27	all acro	Ueshima, Rentz 1990
Metaballus murunatus Rentz, 1985	Australia	27	XO	27	all acro	Ueshima, Rentz 1990
Metaballus nchigyues Rentz, 1985	Australia	27	XO	27	all acro	Ueshima, Rentz 1990
Lanciana albidicornis Walker, 1869	Australia	25	XO	25	all acro	Ueshima, Rentz 1990; Ferreira 1969
Lanciana montana Rentz, 1985	Australia	25	XO	27	L_1 meta; M_2-S_{12}, X acro	Ueshima, Rentz 1990
Lanciana semilata Rentz, 1985	Australia	25	XO	25	all acro	Ueshima, Rentz 1990
Lanciana hisperpotana Rentz, 1985	Australia	21	XO	23	L_1 meta; M_2-S_{12}, X acro	Ueshima, Rentz 1990
Lanciana occidentalis Rentz, 1985	Australia	21	XO	23	L_1 meta; M_2-S_{12}, X acro	Ueshima, Rentz 1990
Ixalodectes nigrifrons Rentz, 1985	Australia	23	XO	23	all acro	Ueshima, Rentz 1990
Ixalodectes uptoni Rentz, 1985	Australia	23	XO	23	all acro	Ueshima, Rentz 1990
Ixalodectes megacercus Rentz, 1985	Australia	15	XO	19	L_1,L_2 meta; M_3-S_7, X acro	Ueshima, Rentz 1990
Ixalodectes whitei Rentz, 1985	Australia	15	XO	19	L_1,L_2 meta; M_3-S_7, X acro	Ueshima, Rentz 1990

Glyphonotinae						
Glyphonotus thoracicus Fischer-Waldheim, 1846	Kazakhstan	21	XO	26	L_1,L_2 meta;M_3-S_{10} acro; Xsubmeta	BUGROV 1990
Nedubinae						
Neduba (Neduba) diabolica (Scudder, 1899)	N. Am.	25	XO	28	L_1 submeta; M_2-S_{12}, X meta	UESHIMA, RENTZ 1979
Neduba (Neduba) macneilli Rentz & Birchim, 1968	N. Am.	25	XO	28	L_1 submeta; M_2-S_{12}, X meta	UESHIMA, RENTZ 1979
Neduba (Aglaothorax) diminutiva Rentz & Birchim, 1968	N. Am.	23	neo- X_1X_2Y	25	L_1-S_{10}, X_2 acro; X_1,Y submeta	UESHIMA, RENTZ 1979
Neduba (Aglaothorax) ovata armiger Rehn & Hebard 1920	N. Am.	23	XO	23	all acro	UESHIMA, RENTZ 1979
Neduba (Neduba) sp.	N. Am.	22	neo-XY	27	L_1,L_2, X submeta;M_3-S_{10}, Y acro	UESHIMA, RENTZ 1979
Platydecticus angustifrons Chopard, 1951	Argentina	37	XO	37	all acro	MESA, FERREIRA 1977a
Tettigoniinae						
Psorodonotus specularis Fischer-Waldheim 1839	Rus-NCau	33	XO	33	all acro	present paper
Eulithoxenus mongolicus (Uvarov, 1928)	Rus-Tuva	31	XO	31	all acro	BUGROV 1990
Drymadusella hissarica (Mistshenko, 1952)	Tadzh	31	XO	31	all acro	WARCHAŁOWSKA-ŚLIWA, BUGROV 1996a
Uvarovina daurica (Uvarov, 1928)	Rus-Sib	31	XO	31	all acro	BUGROV 1990
Alticolana alticola (Tarbinsky, 1930)	Kirghiz	31	XO	31	all acro	present paper
Ctenodecticus major Pascual, 1978	Spain	31	XO	34	S_9, X meta; L_1-S_8, S_{10}-S_{15} acro	CAMACHO *et al.* 1981
Ctenodecticus granatensis Pascual, 1978	Spain	26	neo-XY	33	L_1-S_9, Y acro; S_{11},S_{12}, X meta; S_{10} subacro,	CAMACHO *et al.* 1981
Metrioptera bicolor (Philippi, 1830)	Poland	31	XO	31	all acro	WARCHAŁOWSKA-ŚLIWA 1984b (as *Bicolorana bicolor*)
	N. Korea	31	XO	31	all acro	present paper
Metrioptera arnoldi Ramme, 1933	Bulgaria	31	XO	31	all acro	WARCHAŁOWSKA-ŚLIWA *et al.* 1987
Metrioptera bonetti (Bolivar, 1890)	Japan	31	XO	31	all acro	HAREYAMA 1932b (see ASANA *et al.* 1938)

Metrioptera brachyptera (Linnaeus, 1761)	–	31	XO	31	all acro	WHITE 1936, 1941
	England	31	XO	31	all acro	SOUTHERN 1967, 1968
	Poland	31	XO	31	all acro	WARCHAŁOWSKA-ŚLIWA 1984b
	N. Korea	31	XO	31	all acro	present paper
Metrioptera japonica Bolivar, 1890	Japan	31	XO	31	all acro	KICHIJO 1934; HAREYAMA 1932b, 1939, 1941 (see MAKINO 1951)
	Rus-Kun	31	XO	31	all acro	present paper
Metrioptera saussureana (Frey-Gessner, 1872)	France	29	XO	31	L_1 meta; M_2-S_{14}, X acro	JOHN, HEWITT 1968
Metrioptera roeseli (Hagenbach, 1822)	Poland	31	XO	31	all acro	WARCHAŁOWSKA-ŚLIWA 1984b (as *Roeseliana roeseli*)
	–	31	XO	31	all acro	WHITE 1936
	N. Am.	31	XO	31	all acro	BEAUDRY 1973
Metrioptera ussuriana (Uvarov, 1926)	Russia	31	XO	31	all acro	present paper
	N. Korea	31	XO	31	all acro	present paper
Montana alexandra (Uvarov, 1927)	Kirgiz	31	XO	32	L_1-S_{15} acro; X subacro	WARCHAŁOWSKA-ŚLIWA *et al.* 1994
Montana eversmanni (Kittary, 1849)	Rus-Alt	31	XO	31	all acro	WARCHAŁOWSKA-ŚLIWA *et al.* 1994
Montana montana (Kollar, 1833)	Rus-Alt	31	XO	31	all acro	WARCHAŁOWSKA-ŚLIWA *et al.* 1994
Montana daghestanica Uvarov, 1917	Rus-NCau	29	XO	31	L_1 meta; M_2-S_{14}, X acro	WARCHAŁOWSKA-ŚLIWA *et al.* 1994
Montana tomini (Pylnov, 1917)	Rus-Sib	29	XO	34	L_1,M_3, X submeta; L_2,M_4-S_{14} acro	present paper
Platycleis affinis Fieber, 1853	Italy	31	XO	31	all acro	present paper
Platycleis albopunctata hispanica Zeuner, 1941	Italy	31	XO	31	all acro	CAMACHO *et al.* 1981
Platycleis denticulata (Panzer, 1796)	Poland	31	XO	31	all acro	WARCHAŁOWSKA-ŚLIWA 1984b
Platycleis falx laticauda Brunner von Wattenwyl, 1882	Italy	31	XO	31	all acro	present paper
Platycleis grisea (Fabricius, 1781)	–	31	XO	31	all acro	SINETY 1901; WHITE 1941
	Italy	31	XO	31	all acro	present paper
Platycleis intermedia (Serville, 1839)	Rus-NCau	31	XO	31	all acro	AREFIEJEV 1989
Platycleis pamirica Ramme, 1930	Kirgiz	31	XO	31	all acro	SERGEEV, BUGROV 1988b
Platycleis (*Tessellana*) *tessellata* (Charpentier, 1825)	Italy	31	XO	31	all acro	present paper
	–	31	XO	31	all acro	CSIK, KOLLER 1939 (as *Metrioptera tessellata*)
Platycleis (*Tessellana*) *vittata* (Charpentier, 1825)	Kirghiz	31	XO	31	all acro	present paper

Parapholidoptera noxia (Ramme, 1930)	Rus-NCau	31	XO	31	all acro	present paper
Pholidoptera frivaldskyi (Hermann, 1971)	Bulgaria	31	XO	31	all acro	WARCHAŁOWSKA-ŚLIWA, MICHAILOVA 1993
Pholidoptera griseoaptera (De Geer, 1773)	England	31	XO	31	all acro	HENDERSON 1961
	Poland	31	XO	31	all acro	WARCHAŁOWSKA-ŚLIWA 1984b
Pholidoptera aptera aptera (Fabricius, 1793)	Poland	29	XO	31	L_1 meta; L_2-S_{14}, X acro	WARCHAŁOWSKA-ŚLIWA 1984b, 1988
Pholidoptera aptera karnyi Ebner, 1908	Bulgaria	29	XO	31	L_1 meta; L_2-S_{14}, X acro	WARCHAŁOWSKA-ŚLIWA 1988
Eremopedes ephippiata (Scudder, 1899)	N. Am.	31	XO	31	all acro	MESA, FERREIRA 1977b
Decticita brevicauda (Caudell, 1907)	N. Am.	31	XO	31	all acro	UESHIMA, RENTZ 1979
Decticus albifrons (Fabricius, 1775)	France	31	XO	31	all acro	WINIWARTER 1931 [as *Tettigonia* (*Decticus*) *albifrons*)]
	Spain	31	XO	31	all acro	MOLL 1953b
	Bosnia	31	XO	31	all acro	DELIĆ, SOFRADZIJA 1985
Decticus verrucivorus (Linnaeus, 1758)	–	31	XO	31	all acro	MOHR 1919 (see MAKINO 1951)
	Poland	31	XO	31	all acro	WARCHAŁOWSKA-ŚLIWA 1984b
	–	23*	XO	–	autos.?; X meta	VEJDOWSKY 1912 (see MAKINO 1951)
	–	31	XO	31	all acro	BUCHNER 1909 (see ASANA *et al.* 1938) (as *Decticus verrucosus*)
Gampsocleis burgeri De Haan, 1842	Japan	31	XO	31	all acro	HAREYAMA 1932a
Gampsocleis gratiosa Brunner von Wattenwyl, 1862	China	31	XO	31	all acro	present paper
Gampsocleis sedacovii obscura (Walker, 1869)	S. Korea	31	XO	31	all acro	DOUK HOON *et al.* 1987
	N. Korea	31	XO	31	all acro	WARCHAŁOWSKA-ŚLIWA *et al.* 1992b
Gampsocleis sedacovii sedacovii (Fischer-Waldheim, 1846)	Rus-Alt	31	XO	31	all acro	WARCHAŁOWSKA-ŚLIWA *et al.* 1992b
Gampsocleis ussuriensis Adelung, 1910	N. Korea	31	XO	31	all acro	WARCHAŁOWSKA-ŚLIWA *et al.* 1992b
Gampsocleis ryukyuensis Kato, 1932	Japan	31	XO	32	L_1-S_{15} acro; X meta	UESHIMA 1986
Gampsocleis glabra (Herbst, 1786)	Poland	23	XO	36	L_1 submeta; M_2,M_6,M_7,S_9,S_{11}, X meta; M_3-M_5,S_8,S_{10} acro	WARCHAŁOWSKA-ŚLIWA 1984b
	Caucasus	23	XO	36	L_1 submeta; M_2,M_6,M_7,S_9,S_{11}, X meta; M_3-M_5,S_8,S_{10} acro	present paper
Gampsocleis abbreviata Herman, 1874	Greece	23	XO	36	L_1 submeta, M_2,M_6,M_7,S_9,S_{11} X meta; M_3-M_5,S_8,S_{10} acro	present paper

**Pediodectes* (7 species)	N. Am.	31-28	neo-XY		seven type of karyotypes	UESHIMA, WEISSMAN 1993
**Tettigonia orientalis ibuki* Furukkawa, 1938	Japan	35*	XO	–	autos.?; X meta	HAREYAMA 1932b; OHMACHI 1935 (see ASANA *et al.* 1938)
**Tettigonia orientalis orientalis* Uvarov, 1923	Japan	33*	XO	–	–	HAREYAMA 1932b, 1939, 1941 (see MAKINO 1951)
Tettigonia cantans (Fuessly, 1775)	Poland	29	XO	32	L_1, X meta; L_2-S_{14} acro	WARCHAŁOWSKA-ŚLIWA 1984b
	Slovakia	29	XO	32	L_1, X meta; L_2-S_{14} acro	WARCHAŁOWSKA-ŚLIWA, MARYAŃSKA-NADACHOWSKA 1995
Tettigonia caudata (Charpentier, 1845)	Poland	29	XO	32	L_1, X meta; L_2-S_{14} acro	WARCHAŁOWSKA-ŚLIWA 1984b
Tettigonia viridissima Linnaeus, 1758	Poland	29	XO	32	L_1, X meta; L_2-S_{14} acro	WARCHAŁOWSKA-ŚLIWA 1984b
	Rus-Alt	29	XO	32	L_1, X meta; L_2-S_{14} acro	WARCHAŁOWSKA-ŚLIWA, MARYAŃSKA-NADACHOWSKA 1995
	Spain	29	XO	32	L_1, X meta; L_2-S_{14} acro	MOLL 1953a (as P*hasnogura viridissima)*
	–	29	XO	–	autos.?; X meta	MOHR 1916 (see ASANA *et al.* 1938) (as *Locusta viridissima*)
		33*	XO	–	autos.?; X acro	OTTE 1906
Tettigonia sp.	N.Korea	29	XO	31	L_1 meta; L_2-S_{14}, X acro	present paper
Tettigonia ussuriana Uvarov, 1939	Rus-FEast	29	XO	32	L_1, X meta; L_2-S_{14} acro	WARCHAŁOWSKA-ŚLIWA, MARYAŃSKA-NADACHOWSKA 1995
Atlanticus brunneri (Pylnov, 1914)	Rus-FEast	29	XO	32	L_1, X meta; M_2-S_{14} acro	WARCHAŁOWSKA-ŚLIWA, BUGROV 1996a
	N. Korea	29	XO	32	L_1, X meta; M_2-S_{14} acro	WARCHAŁOWSKA-ŚLIWA, BUGROV 1996a
Atlanticus pachymerus (Burmeister, 1838	–	25	XO	30	L_1,L_2,X meta;M_3-S_{12}acro	WHITE 1941
Atlanticus testaceus (Scudder, 1901)	N. Am.	25	XO	30	L_1,L_2, X meta; M_3-S_{12} acro	UESHIMA, RENTZ 1979
Steiroxys strepens Fulton, 1930	N. Am.	29	XO	31	L_1 meta; M_2-S_{14}, X acro	UESHIMA, RENTZ 1979
Steiroxys trilineatus (Thomas, 1870)	Florida	29	XO	–	all acro?	DAVIS 1908; MEEK 1913 (see MAKINO 1951)
Steiroxys sp.	N. Am.	29	XO	31	L_1 meta; M_2-S_{14}, X acro	UESHIMA, RENTZ 1979
Anabrus simplex (Haldeman, 1872)	N. Am.	29	XO	31	L_1 meta; M_2-S_{14}, X acro	UESHIMA, RENTZ 1979
**Anabrus* sp.	N. Am.	33*	XO	–	–	MC CLUNG 1902,1905,1914
Ateloplus hesperus Hebard, 1934	N. Am.	29	XO	31	L_1 meta; M_2-S_{14}, X acro	UESHIMA, RENTZ 1979
Clinopleura infuscata Caudell, 1907	N. Am.	29	XO	31	L_1 meta; M_2-S_{14}, X acro	UESHIMA, RENTZ 1979
Clinopleura minuta Caudell, 1907	N. Am.	29	XO	31	L_1 meta; M_2-S_{14}, X acro	UESHIMA, RENTZ 1979

Idiostatus aegualis (Scudder, 1899)	N. Am.	29	XO	31	L_1 meta; M_2-S_{14}, X acro	UESHIMA, RENTZ 1979
Idiostatus apollo Rentz, 1973	N. Am.	29	XO	31	L_1 meta; M_2-S_{14}, X acro	UESHIMA, RENTZ 1979
Idiostatus bechteli Rentz, 1973	N. Am.	29	XO	31	L_1 meta; M_2-S_{14}, X acro	UESHIMA, RENTZ 1979
Idiostatus elegans Caudell, 1907	N. Am.	29	XO	32	L_1, X meta; M_2-S_{14} acro	UESHIMA, RENTZ 1979
Idiostatus fuscopunctatus (Scudder, 1899)	N. Am.	29	XO	32	L_1, X meta; M_2-S_{14} acro	UESHIMA, RENTZ 1979
Idiostatus gurneyi Rentz, 1973	N. Am.	29	XO	31	L_1 meta; M_2-S_{14}, X acro	UESHIMA, RENTZ 1979
Idiostatus hermani (Thomas, 1875)	N. Am.	29	XO	32	L_1, X meta; M_2-S_{14} acro	UESHIMA, RENTZ 1979
	N. Am.	29	XO	32	L_1, X meta; M_2-S_{14} acro	UESHIMA, RENTZ 1979 (as *Idiostatus californicus*)
Idiostatus inermis (Scudder, 1899)	N. Am.	29	XO	31	L_1 meta; M_2-S_{14}, X acro	UESHIMA, RENTZ 1979
Idiostatus inermoides Rentz, 1973	N. Am.	29	XO	32	L_1, X meta; M_2-S_{14} acro	UESHIMA, RENTZ 1979
Idiostatus kothleenae Rentz, 1973	N. Am.	29	XO	31	L_1 meta; M_2-S_{14}, X acro	UESHIMA, RENTZ 1979
Idiostatus magnificus Hebard, 1934	N. Am.	29	XO	31	L_1 meta; M_2-S_{14}, X acro	UESHIMA, RENTZ 1979
Idiostatus rehni Caudell, 1907	N. Am.	29	XO	32	L_1, X meta; M_2-S_{14} acro	UESHIMA, RENTZ 1979
Idiostatus nevadensis (Scudder, 1899)	N. Am.	27	XO	29	L_1 meta; M_2-S_{12}, X acro	UESHIMA, RENTZ 1979
Idionotus brunneus Scudder, 1900	N. Am.	27	XO	29	L_1 meta; M_2-S_{12}, X acro	UESHIMA, RENTZ 1979
Idionotus tehachapi Hebard, 1934	N. Am.	27	XO	29	L_1 meta; M_2-S_{12}, X acro	UESHIMA, RENTZ 1979
Anadrymadusa robusta (Miram, 1926)	Rus-NCau	27	XO	29	L_1 meta; M_2-S_{13}, X acro	WARCHAŁOWSKA-ŚLIWA, BUGROV 1996a
Anadrymadusa picta (Uvarov, 1929)	Rus-NCau	27	XO	29	L_1 meta; M_2-S_{13}, X acro	WARCHAŁOWSKA-ŚLIWA, BUGROV 1996a
Bergiola montana Bey-Bienko,1951	Turkmen	27	XO	30	L_1, X meta; M_2-S_{13} acro	WARCHAŁOWSKA-ŚLIWA, BUGROV 1996a
Ceraeocercus fuscipennis Uvarov, 1910	Kazakhstan	27	XO	29	L_1; M_2-S_1, X acro	BUGROV 1990
Paratlanticus ussuriensis (Uvarov, 1926)	Rus-FEast	27	XO	29	L_1 meta; M_2-S_{13}, X acro	WARCHAŁOWSKA-ŚLIWA, BUGROV 1996a
Tadzhikia pavlovskii Mistshenko, 1954	Tadzh	27	XO	31	L_1,L_2 meta; M_3-S_{13}, X acro	WARCHAŁOWSKA-ŚLIWA, BUGROV 1996a
Anatlanticus koreanus Bey-Bienko, 1951	N. Korea	25	XO	29	L_1,L_2 meta; M_3-S_{12}, X acro	WARCHAŁOWSKA-ŚLIWA, BUGROV 1996a
Paratlantica sp.	Japan	25	XO	27	L_1 meta; M_2-S_{12}, X acro	UESHIMA 1986
Onconotus laxmanni (Pallas, 1771)	Rus-Sib	25	XO	27	L_1 meta; M_2-S_{12}, X acro	BUGROV 1990

Plagiostira gillettei Caudell, 1907	N. Am.	25	XO	30	L_1,L_2, X meta; M_3-S_{12} acro	UESHIMA, RENTZ 1979
Capnobotes arizonensis (Rehn, 1904)	N. Am.	23	XO	30	L_1-L_3, X meta, M_4-S_{11} acro	UESHIMA, RENTZ 1979
Capnobotes attenuatus Rentz & Birchim, 1968	N. Am.	23	XO	30	L_1-L_3, X meta; M_4-S_{11} acro	UESHIMA, RENTZ 1979
Capnobotes occidentalis (Thomas, 1872)	N. Am.	23	XO	30	L_1-L_3, X meta, M_4-S_{11} acro	UESHIMA, RENTZ 1979
Zacycloptera atripennis Caudell, 1907	N. Am.	23	XO	30	L_1-M_3, X meta; M_4-S_{12} acro	UESHIMA, RENTZ 1979
Nanodectes dooloides Rentz, 1985	Australia	23	XO	23	all acro	UESHIMA, RENTZ 1991
Nanodectes gladiator Rentz, 1985	Australia	21	XO	21	all acro	UESHIMA, RENTZ 1991
Nanodectes harpax Rentz, 1985	Australia	21	XO	21	all acro	UESHIMA, RENTZ 1991
Nanodectes platycerus Rentz, 1985	Australia	21	XO	21	all acro	UESHIMA, RENTZ 1991
Nanodectes brachyrus Rentz, 1985	Australia	19	XO	21	L_1 meta; L_2-S_9, X acro	UESHIMA, RENTZ 1991
Nanodectes bulbicerus Rentz, 1985	Australia	19	XO	19	all acro	UESHIMA, RENTZ 1991
Nanodectes dooloo Rentz, 1985	Australia	19	XO	21	L_1 meta; M_2-S_9, X acro	UESHIMA, RENTZ 1991
Nanodectes veprephila Rentz, 1985	Australia	17	XO	21	L_1,L_2 meta; M_3-S_8, X acro	UESHIMA, RENTZ 1991
Nanodectes triodiae Rentz, 1985	Australia	15	XO	21	L_1,M_2,M_3 meta; S_4-S_7, X acro	UESHIMA, RENTZ 1991
		15	XO	19	L_1,L_2 meta; L_3-S_7, X acro	UESHIMA, RENTZ 1991
		17	XO	21	L_1,L_2 meta; M_3-S_8, X acro	UESHIMA, RENTZ 1991
		19	XO	21	M_2 meta; L_1, M_3-S_9, X acro	UESHIMA, RENTZ 1991

Bradyporinae

Zichyini

Deracanthina deracanthoides (Bey-Bienko, 1933)	Rus-Tuva	31	XO	31	all acro	SERGEEV, BUGROV 1988a; WARCHAŁOWSKA-ŚLIWA, BUGROV 1996b
Deracanthella verrucosa (Fischer-Waldheim, 1846)	Rus-Trans	31	XO	31	all acro	SERGEEV, BUGROV 1988a; WARCHAŁOWSKA-ŚLIWA, BUGROV 1996b
Zichya baranovi (Bey-Bienko, 1933)	Rus-Tuva	31	XO	31	all acro	SERGEEV, BUGROV 1988a; WARCHAŁOWSKA-ŚLIWA, BUGROV 1996b
Deracantha onos (Pallas, 1772)	Rus-Tuva	29	XO	31	L_1 meta; M_2-S_{14}, X acro	SERGEEV, BUGROV 1988a; WARCHAŁOWSKA-ŚLIWA, BUGROV 1997
	China	29	XO	–	L_1 meta; M_2-S_{14} acro,X subacro?	JU-CHI 1930/31 (as *Callimenus onos*)

Bradyporini						
Pycnogaster finotii Bolivar, 1881	Spain	29	XO	31	L_1 meta; M_2-S_{14}, X acro	SENTIS *et al.* 1988
Pycnogaster graellsii Bolivar, 1873	Spain	29	XO	31	L_1 meta; M_2-S_{14}, X acro	SENTIS *et al.* 1988
Pycnogaster inermis (Rambur, 1839)	Spain	29	XO	31	L_1 meta; M_2-S_{14}, X acro	SENTIS *et al.* 1988
Pycnogaster sanchezgamezi Bolivar, 1897	Spain	29	XO	31	L_1 meta; M_2-S_{14}, X acro	SENTIS *et al.* 1988
Pycnogaster cucullata (Charpentier, 1825)	Spain	29	XO	31	L_1 meta; M_2-S_{14}, X acro	FERNANDEZ-PIQUERAS *et al.* 1982
		28	neo-XY	31	L_1, X meta; M_2-S_{13}, Y acro	FERNANDEZ-PIQUERAS *et al.* 1982, 1983b
Bradyporus dasypus (Illiger, 1800)	Bulgaria	27	XO	32	L_1,L_2, X meta; M_3-S_{13} acro	present paper
**Bradyporus macrogaster pancici* (Brunner von Wattenwyl, 1882)	Macedonia	25*-29*	XO	–	–	GEORGEVITCH 1933 (as *Callimenus pancici*)
Callimenus oniscus Burmeister, 1838	Greece	27	XO	32	L_1, X meta; L_2 submeta; M_3-S_{13} acro	present paper
Ephippigerini						
Ephippiger cavannai (Targioni-Tozzetti, 1881)	Italy	29	XO	31	L_1 meta; M_2-S_{14}, X acro	BULLINI, BIANCHI-BULLINI 1969
Ephippiger discoidalis Fieber, 1853	Croatia	29	XO	31	L_1,meta; L_2-S_{14}, X acro	present paper
Ephippiger ephippiger vitium (Serville, 1831)	Switzerland	29	XO	31	L_1 meta; M_2-S_{14} acro	BIANCHI, MONTALENTI 1966
	France	29	XO	–	–	DODDEMA, PIJANACKER 1977; MATTHEY, 1947
	–	29	XO	33	L_1, X meta; M_2-S_{14} acro	MATTHEY 1939
Ephippiger ephippiger (Fieber, 1784)	France	29	XO	31	L_1 meta; M_2-S_{14}, X acro	DODDEMA, PIJANACKER 1977
	Switzerland	29	XO	31	L_1 meta; M_2-S_{14}, X acro	BIANCHI, MONTALENTI 1966
	Poland	29	XO	31	L_1 meta; M_2-S_{14}, X acro	WARCHAŁOWSKA-ŚLIWA 1984a
Ephippiger ruffoi Galvagni, 1955	Italy	29	XO	31	L_1 meta; M_2-S_{14}, X acro	BULLINI, BIANCHI-BULLINI 1969
Ephippiger zelleri (Fischer-Waldheim, 1853)	Italy	29	XO	31	L_1 meta; L_2-S_{14}, X acro	BIANCHI, MONTALENTI 1966
Ephippigerida nigrosignata (Lucas, 1849)	Italy	29	XO	31	L_1 meta; L_2-S_{14}, X acro	BIANCHI, MONTALENTI 1966
Uromenus (*Steropleurus*) *cockerelli* Uvarov, 1930	Morocco	29	XO	31	L_1 meta; M_2-S_{14}, X acro	BIANCHI, MONTALENTI 1966
	Morocco	29	XO	31	L_1 meta; M_2-S_{14}, X acro	MATTHEY 1948b (as *Steropleurus cockerelli*)
Uromenus (*Staropleurus*) *martorellii* (Bolivar, 1878)	Italy	29	XO	31	L_1 meta; M_2-S_{14}, X acro	FERNANDEZ-PIQUERAS *et al.*1983a
	Italy	27	XO	29	L_1 meta; M_2-S_{13}, X acro	different race (as *Steropleurus martorellii*)
	Italy	25	XO	27	L_1 meta; M_2-S_{12}, X acro	
	Italy	23	XO	27	L_1,L_2 submeta; M_3-S_{11}, X acro	

Uromenus (*Bolivarius*) *brevicollis insularis* Chopard, 1923	Italy	23	XO	27	L_1,L_2 meta; M_3-S_{11}, X acro	Bullini, Bianchi-Bullini 1969
Uromenus (*Bolivarius*) *elegans* (Dubrony, 1818)	Italy	23	XO	27	L_1,L_2 meta; M_3-S_{11}, X acro	Bianchi, Montalenti 1966 (as *Steropleurus elegans*)
	Italy	23	XO	27	L_1,L_2 meta; M_3-S_{11}, X acro	Bianchi, Montalenti 1966 (as *Steropleurus siculus*)
Uromenus (*Uromenus*) *riggioi* La Greca, 1967	Italy	23	XO	27	L_1,L_2 meta; M_3-S_{11}, X acro	Bianchi-Bullini, Bullini 1971
Baetica ustulata (Rambur, 1839)	Spain	25	XO	29	L_1,L_2 meta; M_3-S_{12}, X acro	Fernandez-Piqueras *et al.* 1984
Callicrania seoanei (Bolivar, 1877)	Spain	23	XO	25	L_1 meta; M_2-S_{11}, X acro	Fernandez-Piqueras *et al.* 1981
	Spain	22	neo-XY	24	L_1 meta; M_2-S_{10}, X, Y acro	Fernandez-Piqueras *et al.* 1981
Zaprochilinae Handlirsch						
Kawanaphila goolwa Rentz, 1933	Australia	35	XO	35	all acro	Ueshima 1993
Kawanaphila iyouta Rentz, 1993	Australia	35	XO	35	all acro	Ueshima 1993
Kawanaphila lexceni Rentz, 1993	Australia	35	XO	35	all acro	Ueshima 1993
Kawanaphila mirla Rentz, 1993	Australia	35	XO	35	all acro	Ueshima 1993
Kawanaphila nartee Rentz, 1993	Australia	35	XO	35	all acro	Ueshima 1993
Kawanaphila triodiae Rentz, 1993	Australia	35	XO	35	all acro	Ueshima 1993
Kawanaphila ungarunya Rentz, 1993	Australia	35	XO	35	all acro	Ueshima 1993
Kawanaphila yarraga Rentz, 1993	Australia	35	XO	35	all acro	Ueshima 1993
Windbalea warooa Rentz, 1993	Australia	35	XO	35	all acro	Ueshima 1993
Windbalea viride Rentz, 1993	Australia	35	XO	35	all acro	Ueshima 1993
Anthophiloptera dryas Rentz & Clyne, 1983	Australia	35	XO	35	all acro	Rentz, Clyne 1983
Phasmodes jeeba Rentz, 1993	Australia	31	XO	33	L_1 meta; M_2-S_{15}, X acro	Ueshima 1993
Phasmodes nungeroo Rentz, 1993	Australia	31	XO	33	L_1 meta; M_2-S_{15}, X acro	Ueshima 1993
Phasmodes ranatriformis Westwood, 1845	Australia	29	XO	36	L_1-L_3, X meta; M_4-S_{14} acro	Ueshima 1993
Zaprochilus australis (Brulle, 1835)	Australia	31	XO	31	all acro	Ueshima 1993
Zaprochilus ninae Rentz, 1993	Australia	31	XO	31	all acro	Ueshima 1993
Zaprochilus mongabarra Rentz, 1993	Australia	31	XO	31	all acro	Ueshima 1993

Meconematinae						
Xiphidiopsis straminula (Walker, 1871)	India	33	XO	36	L_2 submeta;L_1,M_3-S_{16} acro; X meta	KACKER, SINGH 1978
Xiphidiopsis sp.	India	33	XO	46	1p. meta, X meta; 2p. submeta; 10 p. acro	ASWATHANARAYANA, UMADEVI 1992
Xiphidiopsis lita Hebard, 1922	Hawaii	26	partheno.	30	L_1,L_2 meta; M_3-S_{12}, X acro	WHITE 1978a
Kuzicus suzukii (Matsumura & Shiraki 1908)	Japan	31	XO	31	all acro	OHMACHI 1943 (see MAKINO 1951) (as *Xiphidiopsis suzukii*)
Leptoteratura albicorne (Motschulsky 1866)	Japan	31	XO	31	all acro	OHMACHI 1943 (see MAKINO 1951) (as *Meconema albicornis*)
Meconema thalassinum (De Geer, 1773)	Poland	27	XO	29	L_1 subacro; M_2-S_{13}, X acro	WARCHAŁOWSKA-ŚLIWA 1984a
Phisis sp.	Australia	21	XO	25	L_1,L_2 meta; M_3-S_{10}, X acro	WHITE 1978a
Incertae sedis						
Yorkiella sp.1	Australia	31	XO	32	L_1-S_{15} acro; X meta	WHITE *et al.* 1967
Yorkiella sp.2	Australia	31	XO	32	L_1-S_{15} acro; X meta	FERREIRA 1969
Chlorobalius leucoviridis Teper, 1896	Australia	20	neo-XY	21	L_1-S_9, Y acro; X meta	WHITE *et al.* 1967 (as *Yorkiella picta* Carl, 1908)
Euhexacentrus annulicornis (Stal, 1877)	India	12	neo-XY	24	all meta	ASWATHANARAYANA, ASHWATH 1985

Species and chromosome numbers marked in the Table by an asterisk (*) probably comprise species erroneously determined, or reported to have an additional chromosome. Since the author had neither access to the original data, nor to the photographs of karyotypes, these species are not included in the further discussion. The genus *Pediodecticus* is analysed on hand of 7 species described by UESHIMA & WEISSMAN (1993). Unfortunately these authors reported only that the chromosome number in this genus ranges between 2n=28, to 2n=31 in males.

Note

Collection locality: Rus-Alt – Russia, Altai Mts; Rus-NCau – Russia, Northern Caucasus; Rus-Sib – Russia, Siberia; Rus-FEast – Russia, Far East; Rus-Kun – Russia, Kunashir Island; Rus-Trans – Russia, Transbaikalia; Kirgiz – Kirghistan; Tadzh – Tadzhikistan; Turmen – Turkmenistan.

Chromosome forms: acro – acrocentric; subacro – subacrocentric; meta – metacentric; submeta – submetacentric; L – large chromosome; M – medium chromosome; S – small chromosome; $_{1.....15}$ – number of the chromosome; partheno – parthenogenetic forms; "–" – data unknown.

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