The chromosomes of *Porcellio scaber* Latreille  
(Isopoda, Oniscidae)  

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Received June 23, 1939  

Upon reviewing the literature concerning the chromosomes of Isopoda one learns that our knowledge is still limited in this direction. At the suggestion of Prof. K. Oguma the authors undertook to make a karyological study of the Japanese terrestrial isopod, *Porcellio scaber*, the results of which are set forth below.  

The authors are greatly indebted to Prof. Oguma for his helpful suggestions and guidance in this investigation.  

*Porcellio scaber* Latreille is a common terrestrial isopod belonging to the family Oniscidae and has a wide distribution on the main-land throughout Hokkaido. They live in the holes of decayed trees or under stones and wood in the fields. To this habit the common name ‘wood-lice’ is due.  

The testes were dissected out by vivisection and with the adhering viscera were dropped into vials containing fixatives. Among all the fixatives used, modified Champy’s fluid with the formula as given below, proved to be the best for the present purpose.  

Champy’s original mixture ....................... 15 c.c.  
Distilled water .................................. 5 c.c.  
Glacial acetic acid .............................. a trace  

The section were stained with Heidenhain’s iron-haematoxylin.  

**Observations**  

The spermatogonium The spermatogonia do not undergo simultaneous division and, therefore, only a few spermatogonia are found in the process of division scattered among the resting cells. At the metaphase the chromosomes constitute a flat equatorial plate, situated well apart from one another. After carefully counting the chromosomes it was decided that the metaphase showed 56 chromosomes (Figs. 1–4). All the chromosomes seem to have median and submedian fibre attachment. In size and shape, they exhibit a gradual seriation in the garniture (Figs. 14–15) with the exception
of a pair of chromosomes of the largest size which stand out quite clearly in contrast with the others. Generally the members of the smallest pair appear as small dots but in a well differentiated preparation they also exhibit a clear median constriction. Fifty-six elements constitute 28 homologous pairs and there are found no chromosomes forming a heteromorphic pair (Figs. 14–15).

The primary spermatocyte  At the metaphase of the first division the bivalent chromosomes are situated well apart in the equatorial plate nearly
at an equal distance from one another. In every equatorial plate examined, 28 tetrads of various forms are counted without any doubt (Figs. 5–8). They vary considerably in shape, some being irregular V's and some are like a thick dumbbell in shape.

One of the critical stages to examine in order to find out whether the tetrads are composed of two equal or unequal components is the anaphase of the primary spermatocyte division where they segregate into constituent elements. For this reason the behaviour of the chromosomes during the anaphasic migration was carefully examined. In division, as clearly seen in the annexed figures, all the tetrads become separated into two equal halves (Figs. 9–11). Generally those of the larger size in the early stage of division assume the shape of an E while smaller tetrads appear lozenge shaped or in the form of an elongated rectangle (Fig. 10). As a result of this examination, therefore, it becomes evident that there is found in the first division no tetrad with a heteromorphic structure formed of two unequal components.

**The secondary spermatocyte** The secondary spermatocyte shows at metaphase 28 chromosomes (Figs. 12–13). They are all V-shaped and thus they correspond in shape to the haploid set of the spermatogonial complement. As the individual chromosomes in this generation of germ cells are very minute, the difficulty of observation precludes a critical examination of these elements.

**Remarks**

Due to the unusual structure of the spermatozoa of isopods, the attention of earlier investigators was attracted towards the study of their morphology and development. Consequently, our knowledge of the chromosomes of this group has been meagre until quite recently. On looking up the literature, one meets with references to a few papers only concerning the chromosomes of isopods, Nichols (1902, 1909), Vandel (1926, 1928, 1934, 1938 a, b), Radu (1930) and Sugiyama (1933) being the only authors. The chromosome numbers known at present in the Isopoda are as follows:

<table>
<thead>
<tr>
<th>Order</th>
<th>Species</th>
<th>n</th>
<th>2n</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asellota</td>
<td><em>Asellus nipponensis</em></td>
<td>7</td>
<td>14</td>
<td>Sugiyama, '33</td>
</tr>
<tr>
<td></td>
<td><em>A. aquaticus</em></td>
<td>8</td>
<td>16</td>
<td>Vandel, '38</td>
</tr>
<tr>
<td></td>
<td><em>Proasellus meridianus</em></td>
<td>8</td>
<td>16</td>
<td>Vandel, '38</td>
</tr>
<tr>
<td></td>
<td><em>Stenasellus verei</em></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Trichoniscus provisorius</em></td>
<td>8</td>
<td>16</td>
<td>Vandel, '26, '28, '34</td>
</tr>
<tr>
<td></td>
<td><em>T. biformatus</em></td>
<td>8</td>
<td>16</td>
<td>Vandel, '26, '28, '34</td>
</tr>
<tr>
<td></td>
<td><em>T. elisabethae</em></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Parthenogenetic female)</td>
<td></td>
<td>24</td>
<td>Vandel, '26, '28</td>
</tr>
<tr>
<td></td>
<td><em>Oniscus asellus</em></td>
<td>16</td>
<td>32</td>
<td>Nichols, '02, '09</td>
</tr>
<tr>
<td></td>
<td><em>Armadillidium opacum</em></td>
<td>27</td>
<td>54</td>
<td>Radu, '30</td>
</tr>
<tr>
<td></td>
<td><em>Porcellio scaber</em></td>
<td>28</td>
<td>56</td>
<td>This paper</td>
</tr>
<tr>
<td></td>
<td><em>Idotea irrata</em></td>
<td>28</td>
<td></td>
<td>Nichols, '09</td>
</tr>
</tbody>
</table>
From this list it will be clearly seen that the chromosome number of the more highly evolved forms of Isopoda such as Armadillidium, Porcellio, Idotea are comparatively greater than those of the primitive forms such as Asellus and Trichoniscus in which quite low numbers are known. Vandel (1938b), discussing the evolution of the karyotypes in the Isopoda, emphasized that this multiplication of the chromosome number is probably linked with the phenomenon of the fragmentation of the chromosomes. According to him, an example of this phenomenon is found in the case of Stenasellus virei with \( n = 24-26 \), which arises from the fragmentation of the basic number, \( n = 8 \), as seen in Asellus aquaticus and Proasellus meridianus. Though one may not necessarily deny the validity of the assumption that in the process of variation of the chromosome number among species fusion and fragmentation of chromosomes play an important part, we are not in a position at present to establish any correlations between chromosomes and the evolution of forms in the Isopoda as our knowledge of the chromosomes of this group is yet too scanty to formulate any rule for general application. Apart from this, it is still interesting to find that in general appearance the chromosome complexes of Armadillidium and Porcellio bear much resemblance to each other, and this is not surprising in view of the close taxonomical relationship existing between the two species.

**Literature**


**Addendum** Since this article went to press there has appeared a paper by Catherine Mir (Le nombre de chromosomes des Ligiidés. C. R. Acad. Sci. 209: 637-639, 1939) in which the haploid numbers for Ligia italica, L. oceanica and Ligidium hypnorum are reported to be 28, 30 and 31, respectively.