situation demands. The larvae of *E. conica* do not follow a specific pattern of construction and fail to enclose themselves in puparial sheath completely. They spin the double sheath, at least in two different patterns the reasons for which, at present are obscure. As far as the behaviour of the larvae of *S. coromondelicum* and that of *S. violaceum* is concerned, the change is restricted to the amount of secreted silk and its utilization in construction of supporting structures like central column and fibres as per demands of 'unnatural' situation. This clearly shows that the larvae of sphecid wasps have the potential to secrete much higher amount of silk, if necessary and that, they are able to discriminate the habitat and decide whether or not there is a need to errect supporting structures.

There is very little difference between the dimensions of the puparia spun in mud cells and those constructed in glass tubes by the larvae of *S. coromondelicum* and *S. violaceum*. Thus the artificially induced changes in the habitat do not affect the size and shape of the puparium. As the silk secreted by larvae of *E. conica* ages, its colour remains unchanged. But, the ageing of the silk produced by the larvae of the sphecid wasps shows definite change; supporting fibres and central column remaining white, while the tubular puparium turns brown. This suggests that the silk secreted by the larvae of *E. conica* is probably composed of only one type of scleroprotein while the silk secreted by the larvae of *S. coromondelicum* and that of *S. violaceum* is composed of at least two different types of scleroproteins. Florkin and Bricteux[11] reported that fibroin made by *Psenulus concolor* (sphecidae) contain high proportion of glycine, alanine, serine and glutamic acid. A comparative biochemical study on composition of silk secreted by the larvae reported in this paper is in progress.

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CHROMOSOME STUDIES IN INDIAN DIPLOPODA (MYRIAPODA) I: A NOTE ON THE OCCURRENCE OF POLYPLOIDY IN *POLYDESMUS GRACILIS*

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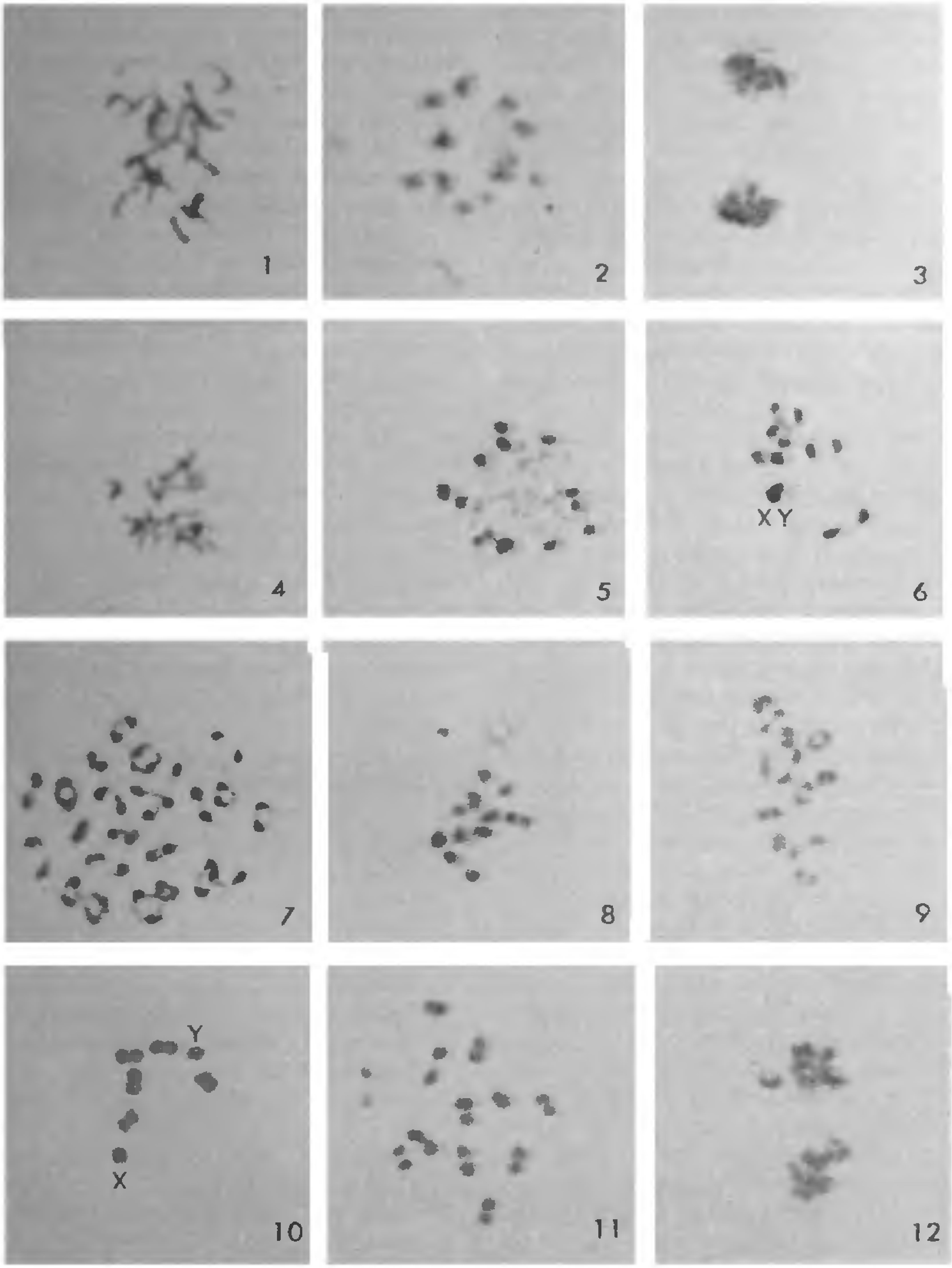
THE application of techniques such as air drying[1], acetic-saline-Giemsa (ASG)[2] and Giemsa C-banding[3] has renewed our interest in the chromosome cytology of Diplopoda which has been reviewed recently[4]. The present paper deals with the cytology of male meiosis of a south Indian millipede, *Polydesmus gracilis* (sp. nov.) using air drying technique.

Males of *Polydesmus gracilis* (family Polydesmidae) were collected from American College Campus, Madurai, during the monsoon season. Adult males were injected with 0.2 ml of 0.05 % colchicine and after 5 hr, testes were dissected in normal saline. Testes follicles were treated separately with one of the hypotonic solutions[5], like 0.125 M potassium chloride and 0.016 M sodium citrate for 1 hr at room temperature. The use of 0.016 M sodium citrate gave the best results in the preparation of both mitotic and meiotic metaphase chromosomes. Air-drying methods[6] were employed as in previous studies[1].

The diploid chromosome number ($2n$) as revealed by both somatic and spermatogonial metaphases is 12 (figures 2 and 4). The male is heterogametic with an XY type of sex-mechanism.

The onset of meiotic prophase is characterized by the appearance of slender chromatin strands, each terminating with a heterochromatic knob (figure 5). Thus there are 12 knobs, which correspond to the



Figures 1–12. Photomicrographs of air dried, Giemsa stained, somatic as well as meiotic chromosome preparations of male *Polydesmus gracilis*. **1.** Mitotic chromosomes from a tetraploid (4n) nucleus. **2.** Somatic metaphase (2n = 12). **3.** Mitotic late anaphase. **4.** Spermatogonial metaphase (2n = 12). **5.** Meiotic prophase, showing heterochromatic knobs. **6.** A late diakinetic configuration. Note the sex-bivalent (XY). **7.** A diakinetic configuration from an octoploid (8n) nucleus. **8.** Premetaphase stage. **9.** Premetaphase bivalents from a tetraploid (4n) nucleus. **10.** Metaphase I, bivalents showing the precocious segregation of sex-chromosomes (XY). **11.** Metaphase I, bivalents from a tetraploid (4n) nuleus. **12.** Anaphase I.

diploid chromosome number. During late diakinesis (figure 6), some of the bivalents still show terminal chiasmata. The sex-bivalent (XY), which undergoes precocious condensation, is recognized as darkly stained element. During 'premetaphase stretch' (figure 8), the bivalents appear to be drawn out. In metaphase I (figure 10), all the autosomes appear dumb-bell shaped, while the sex-bivalent (XY) undergoes precocious division; as a result the first metaphase plate shows 5 autosomal bivalents and 2 sex-univalents (X and Y). The first meiotic division is reductional for the autosomes as well as sex-chromosomes. Meiosis II is equational for all chromosomes. Thus in metaphase II, 6 half-bivalents or dyads are observed.

During routine chromosome analysis, several polyploid nuclei have been observed. These mainly include a few divisional stages pertaining to tetraploid ($4n$) mitotic complement (figure 1), an octoploid ($8n$) diakinetic nucleus (figure 7), a tetraploid ($4n$) premetaphase nucleus (figure 9) and a tetraploid ($4n$) first metaphase complement (figure 11).

The chromosome cytology of *P. gracilis* offers many points of interest. The occurrence of an XY-type in males is in agreement with the findings on the male meiosis of diplopod species thus far studied[4]. The meiotic prophase is marked by the appearance of a pycnotic condensation of chromatin at the end of each thread and the number of pycnotic knobs corresponds to the total number of chromosomes ($2n$) of this species. This phenomenon of heteropycnosis was described earlier in several species of millipedes[4]. It also occurs in Orthoptera[7], Pentatomid Hemiptera[8] and Odonata[9].

The sex-determining mechanism of *P. gracilis* is still in a 'primitive' state as in other diplopods[4]; as such, it is rather difficult to distinguish them (XY) in size and shape. This observation agrees with Ohno *et al*[10], who postulated on the basis of his studies on sex-chromosomes of a variety of placental mammals that X and Y chromosomes have evolved from a homologous pair of autosomes. In general, the sex-chromosomes (XY) form a regular bivalent during meiotic prophase and undergo precocious segregation at metaphase I (see figure 10). Since no studies on female meiosis of any diplopod species have been carried out (owing to technical difficulties involved in chromosome preparation) by anyone so far, the identification of their sex-chromosomes (XY) cannot be proved unequivocally.

Polyploid nuclei occurring extensively in the mitotic as well as meiotic tissues of *P. gracilis* is very characteristic. Muller[11] was the first to point out the relative rarity of polyploidy in animals as compared to plants; because, in bisexual organisms polyploidy will inevitably upset the sex-determining mechanism, since the multiple sex-chromosomes produced would abolish the heterogamety upon which the sex-determination in higher animals depends. This argument holds good for *Drosophila*, but not valid for all animal species[12]. The occurrence of occasional polyploid spermatocytes in otherwise normal testes of triploid and tetraploid individuals in nature as rare aberrations[13] is not uncommon at present in a large number of bisexual animals. The case of Amphibia[14], Sawflies[15], Salamanders[16, 17], Earwigs[18] and ants[19] has revealed authentic instances of polyploidy not associated with parthenogenesis. The new findings recorded from time to time in other organisms also suggest that some polyploidy is present in many bisexual species and the possibility of polyploidy as a positive factor in the evolution of chromosome numbers is increasingly recognized today more than ever before.

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NEWS

MEDICAL HI-TECH

A recent addition to the London Stock Exchange is Oxford Instrument Group, a company in the forefront of medical technology whose sales have increased from £750,000 to £26 million in the last decade. The Group's business is the development, manufacture and marketing of high technology products in the fields of scientific, medical and industrial equipment. It has built a leading position in the supply of superconducting magnet systems for scientific and medical applications, including the Nuclear Magnetic Resonance (NMR) whole-body scanner. It also produces a range of advanced instruments and systems for patient monitoring, biomechanics, materials analysis and for the monitoring and control of industrial processes. NMR scanning and spectroscopy which are both noninvasive and harmless to the patient have been described as the most important medical diagnostic advance since the discovery of x-rays. The most critical component of NMR scanners is the magnet for which strength, temporal stability, uniformity of field and bore size are key performance criteria. The Oxford Group's long experience in magnet technology, continuous investment in research and development and quality assurance programmes have made it the undisputed leader in this field.

The principle applications of this technique are the recording of the electro-cardiogram (ECG) and electroencephalogram (EEG) while a person goes about his daily activities. Medilogs are not only used for everyday monitoring. They have also proved versatile and reliable when used by climbing teams in the Himalayas, by deep sea divers, astronauts, test pilots, polar scientists, racing drivers, life-boatmen, sports referees and for many other unusual applications where doctors wish to find out more about heart and other physiological parameters of the body under stress conditions.

Vicon, a system of infra-red video cameras, instrumentation and photogrammetric software, in use in advanced centres throughout the world, provides three dimensional measurement of movement and can combine this with analysis of the forces and muscle activity required to achieve motion. Precise measurements are complemented by graphic displays describing the movements of the joint centres from which joint reaction forces and movements can be derived. (*The City*, January/February 1984, p. 2; British Information Services, British High Commission, New Delhi 110021).

MICROBES TO FIGHT POLLUTION FAVOURED

The fifteenth International Congress of Genetics has favoured using microbes to monitor and clean up environmental pollution.

The Congress is of the view that there is a great potential for utilizing modern genetic engineering techniques to develop microbial strains for environmental pollutants, such as pesticide residues besides industrial metal mining. This refers to the work done in this area by Dr Ananda Mohan Chakrabarty of the University of Illinois who has developed microbes which 'eat up' toxic material in oil and break down insecticides and pesticides which persist in the soil for a long time. (*ISI Bulletin*, Vol. 36, March 1984, p. 96.)