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The Current Status and Trends in the Research of Chinese Arachnology

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This report includes 4 parts. Ⅰ. The characteristic of Chinese Arachnological research; Ⅱ. Systematic studies on Araneae we made in recent years; Ⅲ. The survey of ecological study on Chinese Arachnology; Ⅳ. Biochemical study on the venom and silk proteins of spiders.

Part Ⅰ deals with the 4 characteristics of Chinese Arachnolgical research.

1. The research work started somewhat lately, but with a faster development. The authors numerated three data of the number of identified species in China, i.e. 438 species Wang and Zhu, 1963); 1053 ones(Zhu, 1983) and 2159 ones(Chen, 1996). The number of 1996 is about twice that of 1983.
2. Research mainly limited on Araneae and Acari didn't cover all orders of Arachnida the research methods mainly are traditional. Some new methods have been tried in recently years, such as the technology of chromosome, isoenzyme and compuuter.
3. Three combinations should be paid attention to in Chinese research work, Combination with teaching work, production and the investigation of natural resources.

Part Ⅱ, Three questions about systematic studies on Araneae are discussed

1. The systematic system of the family Araneidae is based on Roewer-Brignoli-Platnick ststem 292 species belonging to 34 genera and 3 subfamilies were recorded in our monograph fauna Sinica Araneae: Araneidae" But considering the realities of our Country, we made some changes such as the taxonomic position of *Araneus dehaanii* and the revisions of some synonyms (i.e. *Neoscona holmi, Pardosa tschekiangensis*)
2. Distribution of Chinese Araneidae, Lycosidae and Salticidae.
   There is a confused area between Oriental Realm and Palearctic Realm.

The author believes that the demarcation line between these two realms in China may be districted between 34° -37° N.

3. The distribution characteristics of Oriental Realm in China are :
   A. Species are plentiful. The number of the species of the above mentioned three families from Oriental Relm close to or more than half of total one from the Oriental and Palearctic Realms. While the area of Oriental Realm is only half of that of Palearctic Realm
   B. The endemic species of Araneidae and Lycosidae is richer in Oriental Realm than in Palearctic Realm.
   C. The number of species of Hunan run first in China.
   Sourthern west China is the originating and evolutional center of the spiders of the Oriental Realm in China according to the number of endemic species, the climate, geography and the plateau views.

Part Ⅲ deals with the survey of ecological study. The ecological study of Chinese Arachnology developed with the research of controling pests by spiders in agricultural fields. In 1970s, an investigation of the resources of natural enemies has been made in all over our country. It is clear that spider are main components of natural enemies of pests. Up to now, there 373 species collected from rice fields; 205 ones from cotton fields; 194 from citrus grass, and 212 from tea plantation.

The need of production promotes the development of science which is refected both taxonomy and ecology. Chinese ecologists have done the following works in the past 20 years.

(1) Study on the effects of environmental factors, temperature and food factors on ontogeny, fecunity and survival of about 20 species. (2) Through the study on spider population under laboratory condition and agroecological manner, they obtained some valuable results, such as dominant species and the spider population density are variable in different kinds of fields, Provinces, seasons and altitudes etc. : the relationships of spatial pattern, predacious behavior of spiders and its victim in rice field are clear and coincides to each other. (3) The ecologist worked on spider community and diversity in both rice and cotton fields. They found that the different environments cause the difference of spider diversity, the components of spider diversity and its distribution trends. They also tried to classify the types of distribution groups of spider community in national ecological system as well as the

agroecological system. Single types of distribution groups of spider community were discussed. (4) The ecologist study has a developmental proces in China. That is development is from static to dynamic. from individual to community, from determining the nature to determing the quantity. Now research methods must be used especially the biostatistics, serological and computer technologies.

Part Ⅳ. The author briefly explains the works about the biochemical research of venom and silk of spider in China in this paper. In 1980s, Xu Ke and al. firstly found the crude venom of *Lycosa singoriensis* could block the glutamate neuromuscular synaptic transmission. Then peptides inhibting bacteria and components inhibiting the group of the breeding cells of lung cancer from the same spider were also reported. In 1990s, Prof. Liang Song-Ping in our University carried out data studies on the bird spider, *Selenocasmia huwena* et al.. Their works include : a new method to collect the venom from living spider : the properties of its crude venom((the LD50 value to the mouse and the America cockroach, the density, the protein concentration, the enzymeactivity and and the biological function of blocking the neuromuscular transmission ect. They solated many peptide compounds with biological activity from the venom of Selenocosmia huwena. A kind of neurotoxin named Huwentoxin (HWTX-1) and a small lectin-like peptide named SHLP-1 were found. Their amino acid sequence and the linkages of the disulfide bonds were determined. The structure of HWTX-1 and SHLP-1 shows a motif consisting of three disulfide bonds and triple-stranded antiparallel β-sheet by two dimentional NMR. Synthesis of HWTX-1 succeeded through chemical ways manually. This is the first natural toxin which has been defined the chemical and spatial structure and realized he synthesis by manual in China, prof. Liang Song-ping and al. suggest to take the structure of HWTX-1 and SHLP-1 as domain and carry out molecular designment and definite transformation based on the threebridgès and triple-stranded β-sheet domain and to obtain new type proteins with defined pratical properties by protein engineering. Spider's silk is one of the best natural fibers. As for China, the study on this silk protein may has been made in our department. Xie Jin-Yun, Liang Song-Ping, and their colaborers have been studing on the object. After analysing three species of spider by HPLC, they found that there were differences of the

amino acid composition among the silk proteins from different species as well as the different silk proteins from one species. As for dragline of *Araneus ventricosus*, the small side-chain aminoacids are predominant. The bulk-side amino acids, such as Pro. Lys. and Leu. are abundant.

In their present paper, they have selected *Araneus ventricosus* for research. Severl experiments have been made on microstructure of its dragline and major ampullate silk gland; the spatial structure of dragline fibroin. Some results are the sack-like midplace of ampullate silk gland should be not only a reservior of silk fluid, but also a factory of protein synthesis; the data of mechanical property verified that the dragline of *A. ventricosus* has best elongivity; by means of partial acid hydrolysis and HPLC, several peptide fragments of the dragline fibron were purified; the sequences of these purified peptide are different from that of the fibron from *Nephila clavips* except one fragment with the sequence of GYGPG which exists in both of the finished from two different species of spiders.