

# A new *Dianous* species (Coleoptera, Staphylinidae, Steninae) from China, with a key to Chinese species of the *coerulescens* complex

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## Abstract

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A new *Dianous* species (Coleoptera, Staphylinidae: Steninae), *D. zhejiangensis* sp. n. from Zhejiang province, China is described and a key to Chinese species of the *coerulescens* complex is given. The distributional patterns of the genus *Dianous* in China are discussed.

## Key Words

Zoogeography

Taxonomy

Oriental Region

## Introduction

The genus *Dianous* Leach 1819 is one of the two Steninae genera (Coleoptera, Staphylinidae), with more than 210 species described up to now (Herman, 2001; Löbl & Smetana, 2004; Puthz 2005a, b). Its type species is *D. coerulescens* Gyllenhal. Puthz (1981) made the earliest attempt to recognise species-groups (group I and group II) for all the species included in the genus *Dianous*. Naomi (1988) revised Japanese species of the genus *Dianous* and erected four species-groups which obviously different from those established by Puthz (1981). Subsequently, based on morphological studies with especial considerations of sexual characteristics, Puthz (2000, 2005a) divided one species-group (group II) into eight complexes, namely the *calceatus* complex, *yunnanensis* complex, *lobigerus* complex, *aereus-andrewesi* complex, *ocellatus* complex, *chinensis* complex, *coerulescens* complex and *luteoguttatus* complex, meanwhile maintained another (group I) as it was. Furthermore, Puthz (2000) reviewed the species of *Dianous* from China and the adjacent countries. In this paper, we select to follow the Puthz's system, but the internal relationships of this diverse genus are not very

clear and some taxonomic problems are still unresolved; not all the species (e.g. *D. naicus* Puthz, *D. puthzi* Lundgren, *D. smetanai* Puthz) fit into this system. Therefore we consider that it is important to offer an accurate diagnosis for the species groups, to identify the species correctly, and to revise the regional fauna. We hope that our results can promote such kind of studies and provide a reliable basis for zoogeographic and phylogenetic studies of Chinese *Dianous* in future.

Faunistically, China owns one and covers at least other two of 25 global biodiversity hotspots, i.e. the mountains of southwest China, Himalayas and Indo-Burma (Myers et al. 2000). At least 93 species of *Dianous* were recorded from China, which amounts to 44% of the known species of the genus worldwide. In this paper, based on thorough and detailed data of *Dianous* specimens from China, we discussed distribution patterns of the genus *Dianous* in China and recognized some new components of the *Dianous* fauna in this study. These additional distributional data may benefit the *Dianous* zoogeographic study to a great extent in future.

This paper describes also one new species, *D. zhejiangensis* sp. n. from Zhejiang province in East China,

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and offers also a key to the Chinese species of the *coerulescens* complex.

## Materials and methods

Specimens preserved in 75% ethanol were dissected to examine morphology of the aedeagus, male abdominal sternites VIII and IX, the valvifer and female sternite VIII, using a Leica-MZAPO stereomicroscope. The type specimens of the new species are deposited in the Institute of Zoology, Chinese Academy of Sciences (IOZ-CAS), Beijing.

The distributions of all treated species of Chinese *Dianous* were mapped by the PC programs ArcView 3.2. Geographical data of species were compiled from two sources: all published literature and label records of some specimens (including some types) from the following collections:

BMNH	the British Museum of Natural History, London, UK
FMNH	Field Museum of Natural History, Chicago, USA
IOZ-CAS	Institute of Zoology, Chinese Academy of Sciences, Beijing, China
MNHUB	Museum für Naturkunde, Humboldt-Universität, Berlin, Germany
NHMW	Naturhistorisches Museum, Wien, Austria
ZALF (DEI)	Deutsches Entomologisches Institute, Müncheberg, Germany

ZISP	Zoological Institute Russian Academy of Sciences, Petersburg, Russia
ASC	Collection of Ales Smetana, Ottawa, Canada
GRC	Collection of Guillaume de Rougemont, Londinières, France
VPC	Collection of Volker Puthz, Schlitz, Germany

*Terminology.* fore body = from apical margin of head to posterior apex of elytron.

## Results

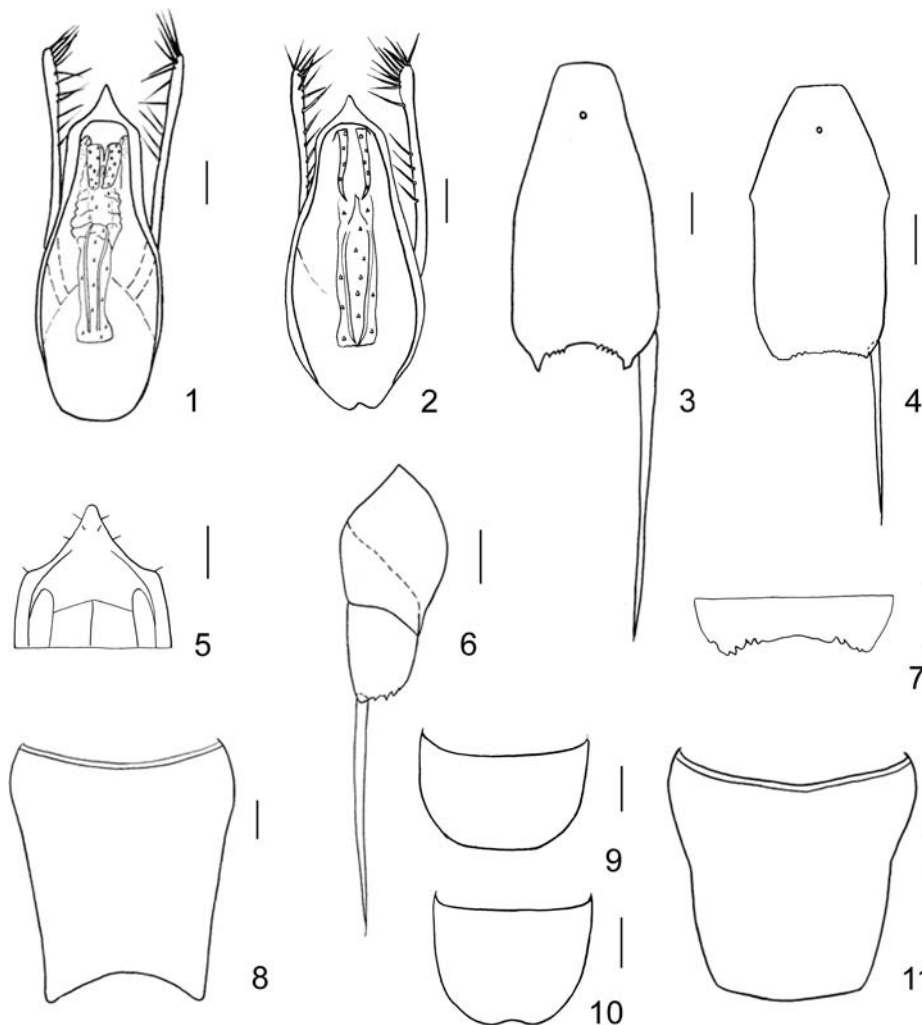
### *Dianous zhejiangensis* sp. n.

Figures 1–11

*Type Material.* *Holotype male*, China, Zhejiang Province, Fengyang Mountain, 27°75' N, 119°10' E, 1400–1500 m, 26–29. July 2007, collected by Zong-yi Zhao (deposited in IOZ-CAS). *Paratypes*. 15 males, 30 females, same data as holotype.

*Description.* Body length: 5.65–5.90 mm; fore body: 2.80–3.00 mm. Body black, with faint bluish tint. Antennae and maxillary palpi black. Clypeus and labrum black with metallic bluish reflex. Paraglossa oval. Legs black, fourth segment of metatarsi very deeply bilobed.

Head as wide as elytra (1.12 mm), with an average distance between eyes of 0.64 mm. Temple length



**Figures 1–11.** *D. zhejiangensis*, sp. n. and comparison species. **1.** Aedeagus of *D. zhejiangensis* sp. n.; **2.** Aedeagus of *D. ater* Puthz; **3.** Sternite IX of *D. zhejiangensis* sp. n. (male); **4.** Sternite IX of *D. ater* Puthz (male); **5.** Apical portion of median lobe of *D. lobatipes* Puthz (cf. Puthz 2000); **6.** Valvifer of *D. zhejiangensis* sp. n. (female); **7.** Posterior portion of sternite IX of *D. lobatipes* Puthz (male) (cf. Puthz 2000); **8.** Sternite VIII of *D. zhejiangensis* sp. n. (male); **9.** Tergite X of *D. zhejiangensis* sp. n. (male); **10.** Tergite X of *D. zhejiangensis* sp. n. (female); **11.** Sternite VIII of *D. zhejiangensis* sp. n. (female). Scale bar: 0.1 mm.

0.19 mm. Eye length 0.49 mm. Frons with two deep longitudinal furrows reaching to posterior margin of head, furrows diverging in posterior half, converging anteriorly, area between these furrows slightly concave, lower than the level of inner margin of eyes. Dorsal surface of head covered with dense punctures and long pubescence. Diameter of puncture slightly larger than diameter of median eye facets; interstices on average equal to or slightly larger than punctures. Clypeus and labrum covered with white pubescence and sparse punctures. Antennae long, when reflexed extending beyond posterior margin of pronotum by last three segments, antennal segment X about twice as long as wide (0.15:0.08 mm).

Pronotum longer than wide (0.90:0.83 mm), widest at anterior 1/3 of its length, sides round before anterior 1/3, almost parallel posteriorly. Puncturation only near lateral margins clear, as large as the basal cross-section of third segment of antennae; interstices smaller than diameter of punctures. Surface uneven, some punctures near anterior margin confused, forming a few of long transverse rugae; some on area of posterior 1/3 forming regular transverse rugae; others forming irregular short rugae.

Elytra longer than wide (1.20:1.14 mm), slightly widened caudad, suture length 1.18 mm, lateral margins weakly bent near posterior angles, posterior margin of elytra slightly emarginate; humeral angles prominent with shallow depressions. Punctures on elytra confused forming rugae mostly. Rugae on anterior 1/2 of elytra arrayed transversely; on posterior 1/2 arrayed obliquely from middle of lateral margin to terminal of elytral suture. Depressions on middle of posterior 1/2 of elytra are similar to those of humeri. Hind wings fully developed.

Abdomen robust; paratergites of III–VI distinct, those of tergite IV as wide as apical cross-section of metatibiae. Punctures on paratergites similar to those on tergites III–VI. Puncturation of tergites III–VII dense and fine, as large as diameter of median eye facets; interstices smaller than diameter of punctures; tergite VIII with slightly large and sparse punctures. Microsculpture on tergites VIII and IX distinctly reticulate.

Legs slender, first segment of metatarsi as long as the following three segments (2nd, 3rd and 4th) together and

clearly longer than 5th segment (0.43:0.28 mm), 4th segment of metatarsi very deep bilobed, longer than half of 5th segment length.

*Male.* Metaventricle broadly convex, with a glabrous triangular area in middle and very sparse fine punctures in lateral areas. Abdominal sternites III–V with very sparse punctures; sternites VI and VII covered with dense fine punctures and short pubescence; sternite VIII (Fig. 8) with apical emargination, 1/7 as deep as the sternite length; sternite IX (Fig. 3) with long apico-lateral teeth, apical brush as long as the sternite. Tergite X broadly round (Fig. 9). Aedeagus as in Figure 1, apical portion of median lobe triangularly, parameres longer than median lobe, with 13–15 long setae.

*Female.* Sternites of the abdomen are similar to those of male, but hind margin of sternite VIII broadly rounded (Fig. 11). Apex of valvifer broad, with several denticles laterally, apical brush nearly as long as valvifer length (Fig. 6). Tergite X round, hind margin with shallow arcuate emargination (Fig. 10).

*Remarks.* This new species belongs to the *coerulescens* complex based on these characteristics (eyes large, temple less than half of eye length, without tarsal shoe; aedeagus apical portion of median lobe triangularly narrowed, parameres with one group of uniform setae; female sternite VIII rounded). The new species may be easily distinguished from *D. ater* Puthz by dark body with metallic bluish tint and maxillary palpi blackish, whereas in *D. ater* body with greenish metallic tint and maxillary palpi with total segment 1 and the narrow base of segment 2 brownish. The new species has aedeagus as shown in Fig. 1 (cf. Fig. 2) and the hind margin of sternite IX of male have distinct long apico-lateral teeth (Fig. 3, cf. Fig. 4). The new species is to some extent similar to *D. lobatipes* Puthz, but differs from this species by its head being narrower than elytra (*D. lobatipes*, head wider than elytra), hind margin of sternite IX (Fig. 3, cf. Fig. 7, cf. Puthz, 2000), middle of abdominal sternite VI with dense fine punctures (*D. lobatipes*, without punctures there), and by apical portion of aedeagus (Fig. 5, cf. Puthz, 2000).

*Distribution.* China (Zhejiang).

*Etymology.* The species name is derived from its type locality name, Zhejiang Province, China.

### Key to the Chinese species of the *coerulescens* complex

1. Elytra without spots ..... 2
- Elytra with spots ..... 6
2. Rugae of elytra forming vortices ..... 3
- Rugae of elytra not forming vortices; aedeagus as in Fig. 2. .... *D. ater* Puthz  
..... Distribution: Taiwan
3. Bilobe of 4th segment of metatarsus distinctly longer than 1/2 length of 5th segment ..... 4
- Bilobe of 4th segment of metatarsus shorter than 1/2 length of 5th segment ..... 5
4. Head wider than elytra ..... *D. lobatipes* Puthz  
..... Distribution: China (Anhui)

- Head narrower than elytra; aedeagus as in Fig. 1 ..... *D. zhejiangensis* sp. n.  
..... Distribution: China (Zhejiang)
- 5. Antennae long, when reflexed extending beyond the posterior margin of pronotum by last four or five segments. Segment 1 of maxillary palpi black ..... *D. cameroni* Champion  
..... Distribution: China (Yunnan), Pakistan, India, Nepal.
- Antennae slightly shorter, when reflexed extending beyond the posterior margin of pronotum by last one or two segments. Segment 1 of maxillary palpi bright brown ..... *D. cupreogutta* Puthz  
..... Distribution: Taiwan
- 6. Rugae of elytra forming vortices ..... *D. klapperichi* L. Benick  
..... Distribution: China (Fujian)
- Rugae of elytra not forming vortices ..... 7
- 7. Lobes of 4th metatarsus distinct shorter than 1/2 length of the last segment ..... *D. cupreostigma* Puthz  
..... Distribution: Taiwan
- Lobes of 4th metatarsus equal or longer than 1/2 length of the last segment ..... 8
- 8. Segments 3 and 4 of antennae brown ..... 9
- Segments 3 and 4 of antennae black ..... 12
- 9. Elytra trapeziform ..... *D. electrigutta* Puthz  
..... Distribution: Taiwan
- Elytra subquadrate ..... 10
- 10. Head narrower than elytra ..... *D. sucinigtatus* Puthz  
..... Distribution: China (Sichuan)
- Head broader than elytra ..... 11
- 11. Elytra slightly longer (1.15–1.55 mm); elytral spots very large ..... *D. sucininotatus* Puthz  
..... Distribution: Taiwan
- Elytra shorter (1.00–1.30 mm); elytral spots small ..... *D. sucinigutta* Puthz  
..... Distribution: Taiwan
- 12. Metatibiae longer than metatarsi; aedeagus cf. Puthz (2000, figs 222, 223, 225) ..... *D. freyi* L. Benick  
..... Distribution: China (Zhejiang, Anhui, Fujian, Jiangxi, Hubei, Hunan, Sichuan, Guizhou, Yunnan)
- Metatibiae as long as metatarsi; aedeagus cf. Puthz (2000, fig. 217) ..... *D. mendax* Puthz  
..... Distribution: Taiwan

### Distribution of the genus *Dianous* in China

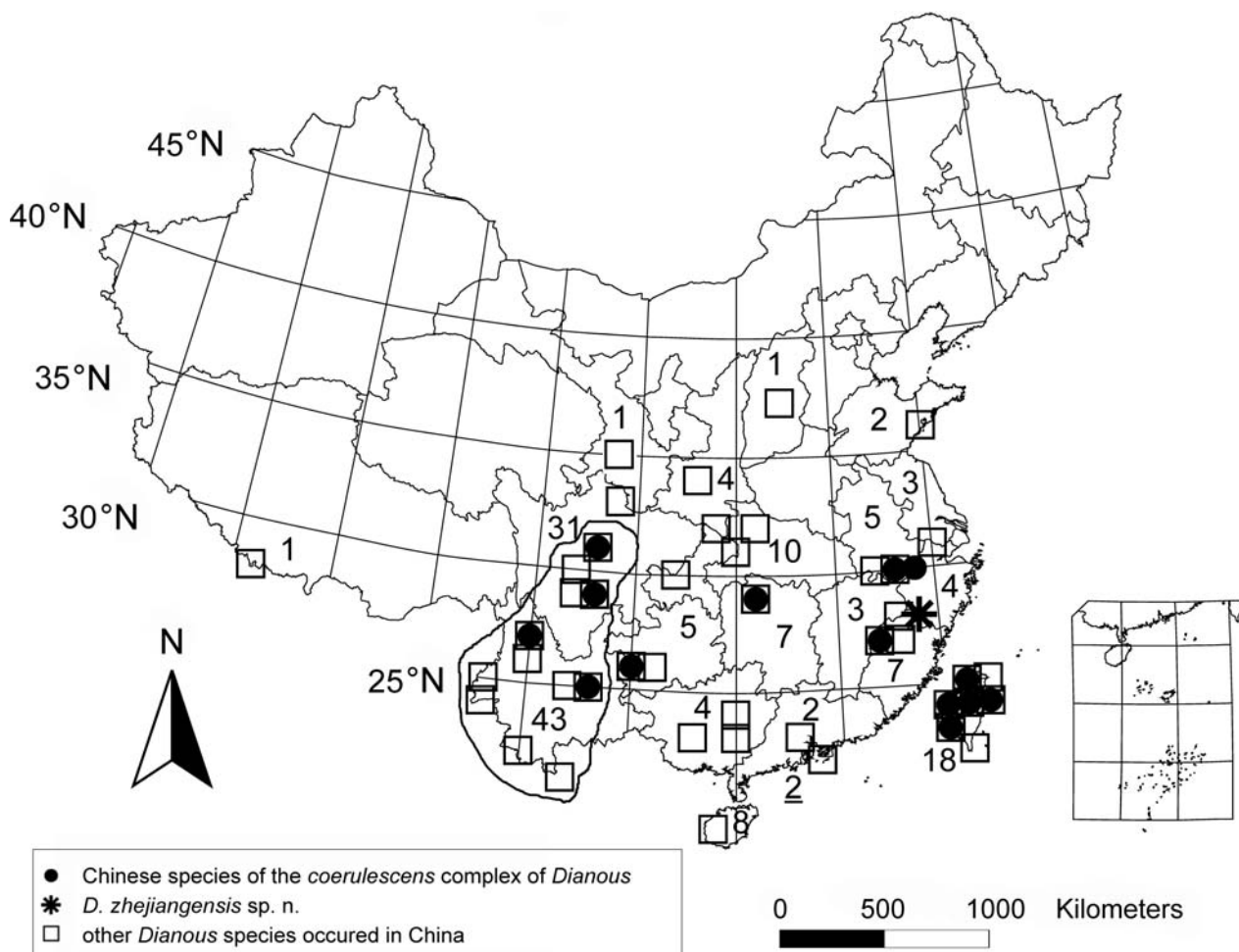
The general distribution pattern of the genus *Dianous* is very uneven in China (Fig. 12). The figure shows that most species are distributed in the south of China, especially the eastern and south-eastern parts of the Qinghai-Tibetan Plateau. Only a few species occur in the north of China. A large number of species (43 species) are found in Yunnan, followed by Sichuan (31 species) and Taiwan (18 species).

In order to illustrate distribution pattern according to latitude, species richness is shown in different intervals (Fig. 13). The overwhelming majority (57 species) occur between 22°–25° N. Based on our data and existed publications, the southernmost point of distribution record is Jianfengling (18°24' N), Hainan Province, where *D. coeruleomicans* Puthz and *D. cupreoviolaceus* Puthz were recorded; the most northernmost point is Taigu Country (37°42' N), Shanxi Province, where *D. yangae* Puthz were recorded (Hao et al., 2003). Our data also show an extensive range of vertical distribution for Chinese *Dianous*, from 100 m to 3700 m. Similarly, we divided the whole altitudinal range into 37 intervals with every 100 m as each one to show the pattern of vertical distribution to the Chinese *Dianous* species (Fig. 14). The species richness of *Dianous* reaches a peak (41 species) between 701 and 800 m where it takes a total of 44% Chinese *Dianous* fauna.

To a conclusion, most species of Chinese *Dianous* are distributed in the south of China, especially the eastern and south-eastern parts of the Qinghai-Tibetan Plateau; they occur in a limited latitudinal range (18°–38° N) and a relatively large altitudinal range (100–3700 m). The richest latitudinal and altitudinal intervals are 22°–25° N and 701–800 m respectively. With the latitude and altitude ascending or descending, the species richness of *Dianous* decreases gradually.

### Discussion

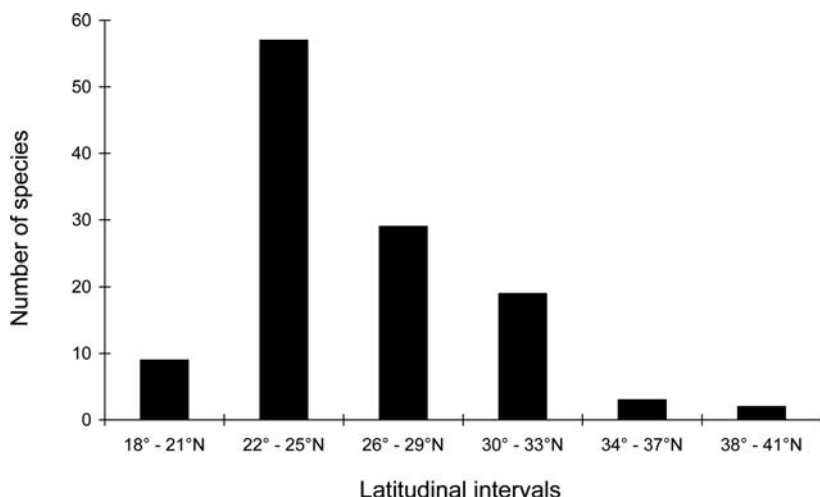
The most important work on the fauna of Chinese *Dianous* is Puthz (2000). Our result shows that the Chinese *Dianous* species distributed mainly in mountainous areas in the Oriental region. This accords with the data given by Puthz (2000). Ecological environment influences species composition and distribution greatly. Most Chinese species of *Dianous* occur in a region located in the eastern and south-eastern of the Qinghai-Tibetan Plateau, including the areas of Emei Mountains, Hengduan Mountains, Gaoligong Mountains and south of Yunnan (cf. Fig. 12). This region intersects with the mountains of south-west China, which are listed as a hotspot by Conservation International ([www.biodiversityhotspots.org/xp/Hotspots](http://www.biodiversityhotspots.org/xp/Hotspots)). This



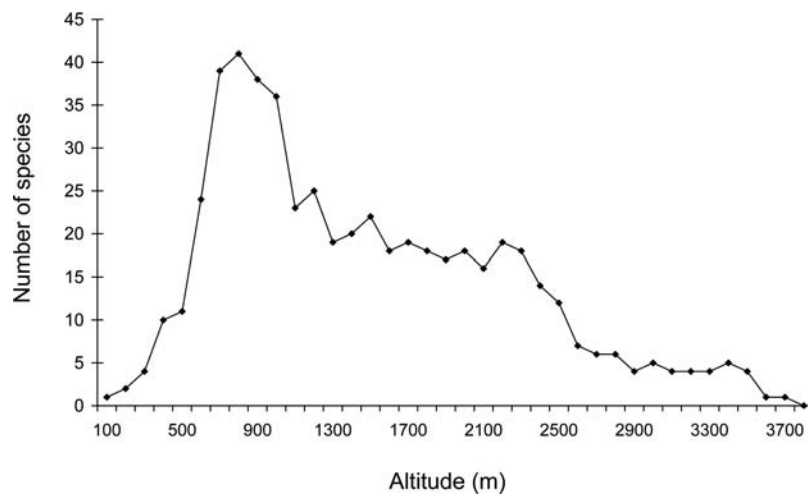
**Figure 12.** Geographical pattern of the genus *Dianous* in China. Arabic numerals denote the number of species occurred in different administrative unites of China; Arabic numeral with underline denotes the number of species occurred in Hongkong; solid line indicates the track of distribution center to Chinese *Dianous*.

region is characterized by extremely complex topography, climatic conditions and vegetation types, which can offer of course a high diversity and heterogeneity of microhabitats for *Dianous* species. Our result indicates that this region should be a distribution center of

Chinese *Dianous*. Taiwan is also rich in species which may result from its special isolated island conditions. Therefore, we suggest here the region mentioned above and Taiwan should have in priority in national and international activities of biodiversity conservation.



**Figure 13.** Latitudinal distribution for the species of *Dianous* from China.



**Figure 14.** Altitudinal distribution for the species of *Dianous* from China.

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