

Rhipicephalus sanguineus (Latreille 1806); A new Record of Male Tick Identified with Scanning Electron Microscopy in Korea

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*Rhipicephalus sanguineus*에 대한 最初の 國內報告와 수컷에 대한 走査電子顯微鏡의 觀察

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抄 錄: 개진드기 (*Rhipicephalus sanguineus*, Latreille 1806)는 世界的으로 가장 넓은 分布를 보이는 種類로서 알려져 있으나 지금까지 國內에서는 그 調査가 實施된 바 없다.

1981年 부터 1984年에 걸쳐 우리나라 家畜 진드기의 生能調査 및 防除對策에 關聯된 몇가지 試驗 研究事業을 遂行하는 동안 京畿, 忠南, 全北 및 濟州地域의 牧場에서 飼育하고 있는 개와 부근의 草地로부터 未飽血 또는 部分 飽血된 진드기 材料를 採集하여 調査, 分類, 同定 해 본 結果, *P. sanguineus*로 確認 되었다.

*R. sanguineus*의 國內 調査와 그 記錄과 더불어 수컷材料에 對한 走査電子顯微鏡 (SEM) 映像攝影 寫眞과 함께 形態學의 特徵을 觀察하여 報告한다.

*R. sanguineus*의 國內 棲息이 確定됨에 따라 總8屬 (*Argas*, *Amblyomma*, *Boophilus*, *Dermacentor*, *Haemaphysalis*, *Hyalomma*, *Ixodes*, *Rhipicephalus*)의 진드기가 分布함이 밝혀졌다.

Introduction

There was no report on *Rhipicephalus* species inhabitation in Korea, although the genus *Rhipicephalus* is the most widely distributed ixodid tick all over the world^{2, 6, 7, 14, 21-24, 27, 31-33, 36, 38}. When the national project had been carrying out studies of tick biology and tick-borne disease control in domesticated animals, some unknown tick specimens were collected from dogs rearing in the livestock farms and in the vicinity of the farms located in Kyunggi-Do, Chungchong-Namdo, Cholla-Pukdo and

Cheju-Do during 1981-1984.

The tick specimens were examined at the Institute of Veterinary Research in Anyang and then identified as brown-dog tick *Rhipicephalus sanguineus* (Latreille 1806). The morphological characteristics were described as seen with or by binocular stereoscopic microscope and the further fine underparts were observed by means of the scanning electron microscope.

Rhipicephalus sanguineus is now firstly recorded to occur in Korea^{20, 21, 33} and some extraordinary pictures of the specimens taken by the scanning

electron microscope are presented in this report.

Problem of this tick transmitter of Babesia Anaplasma Rickettsia e. f. c.

Materials and Methods

Specimen Examined and the Localities Collected:

A total of 51 adult ticks collected from dogs or pastures in 4 localities in Kyunggi, Chungnam, Chonpuk and Cheju, during 1981~1984.

Preservation and Examination of the Specimens: The specimens were preserved in 10% formal-saline or 70% ethyl alcohol containing 5% glycerine.

A binocular stereoscopic microscope was used primarily for the morphological observation of the specimens. A compound trinocular microscope was also used as necessary for the finer details of some structures. Further details were observed and described as seen on the screen of the scanning electron microscope.

Scanning Electron Microscopy: Fixation of the specimens was performed in 10% formal-saline or 70% ethyl alcohol containing 5% glycerine. Drying in the air approximately 30°C was sufficient for the chitinous specimens. The dried specimens, were then fixed on the stubs by means of both-sided serotapes or scanning electron microscope paste and finally subjected to evaporation with gold using an ion coater³⁰⁾. The scanning electron microscope (SEM) manufactured by the Korea I.S.I. Co. Ltd. (Model ISI-DS-130) was used for observation and microphotography.

Classification and Identification: The description of the specimens was compared with the identification key to species of the genus *Rhipicephalus*

suggested by Campbell (1968)⁹⁾ and the views of Feldman-Muhsam (1952)¹¹⁾, (1956)¹²⁾, Hoogstraal (1956)¹⁴⁾, Roberts(1970)²⁷⁾, Yamaguti *et al*(1971)³⁸⁾ and Campbell(1977)¹⁰⁾ were helpful for the diagnosis of the specimens.

Results

Collection Record: A total of 51 adult ticks consisted of 32 males and 19 females was collected from dogs rearing in the livestock farm located in Duckso, Kyunggi-Do in June 1981, on the pastures near the farms located in Yunki, Chungchong-Namdo, in Iksan, Cholla-Pukdo, in Namcheju, Cheju-Do in 1982 and 1984, respectively, as shown in Table 1.

The sex ratio of the ticks collected was 1.68 : 1 (Male : female) and it was confirmed that *Rhipicephalus sanguineus* is very rare in Korea, while the ticks of *Haemaphysalis longicornis*, *Boophilus microplus* and *Ixodes persulcatus* are abundant throughout the peninsula of Korea and/or predominant in the specific localities according to the ecological characteristics of the tick^{19,20,40)}.

Description of Male Specimen: The body was ornate pearshaped and brown with slightly convex scutum on which the deep lateral, posteromedian and paramedian grooves were distinct (Fig. 1 and 2). The festoons were present and distinct with 11 partitions (Fig. 2). The scutal punctations were present less regular and widely spaced (Figs. 2 and 10). The eyes were present but slightly rounded flat and faint. The overall body size was 3.4mm in length and the maximum width was 1.9mm. The length of the capitulum was 0.6mm and the width

Table 1. Collection record of *Rhipicephalus sanguineus* from dogs or on pastures during 1981 to 1984 tick survey in Korea

Year	Month	Locality	Habitat	Tick specimens		
				Male	Female	Total
1981	June	Duckso, Kyunggi	Dogs	16	7	23
1982	August	Yunki, Chungnam	Pasture	4	3	7
1982	September	Iksan, Chonpuk	Pasture	7	5	12
1984	July	Namcheju, Cheju	Pasture	5	4	9
1981-1984	June-September	4 Localities	—	32	19	51

was 0.7mm measured. The basis capitulum was hexagonal and the palpi were short approximately 0.3mm. The processes on the articles I and IV were distinct ventrally (Figs. 3 and 5). The setae on the basis capitulum were 5 left and 5 right laterally and 4 dorsally (Figs. 3, 4 and 5). The hypostome dentition was 3/3 and the setae on the articles (ventrointernal setae) were distinct in ventral view (Fig. 5). The Corona was well developed (Fig. 6).

The dorsal projection on the trochanter I was distinct and the leg joints were extremely well developed and specified (Figs. 7 and 8). The coxa I was bifid with a dorsal projection. The setae on the abdomen were well developed (Fig. 9). A pair of angular adanal shields was present and also a pair of accessory shields was distinct.

The genital aperture was located on a level with coxa II, and the anus on a level with posterior margin of spiracular plates. The spiracular plates were comma-shaped and situated posterolaterally to coxa IV.

Identification and Diagnosis: The specimens were easily diagnosed and identified as *Rhipicephalus sanguineus* according to the morphological characteristics described above and to the comparisons with the views of Feldman-Muhsam(1952)¹¹⁾, Hoogstraal(1956)¹⁴⁾, Keegan and Toshioka(1977)²¹⁾, Roberts(1970)²⁷⁾ and Yamaguti *et al*(1971)³⁸⁾.

Discussion

Hoogstraal(1956)¹⁴⁾ has mentioned that *R. sanguineus* was first native tick of Africa and is probably the most widely distributed tick species in the world, although the populations vary considerably in density from one area to another.

R. sanguineus had already been reported to occur in Kyushu, Japan(Sugimoto 1937)³³⁾, however, Yamaguti *et al*(1971)³⁸⁾ supposed that it might have been introduced into Japan on pets of United States Forces personnel or in household effects. Then³⁸⁾ also mentioned that Leeson(1951)²³⁾ had not include Japan and Korea as parts of the distributional areas of *R. sanguineus*, but the special map published by the American Geographic Society (1954) shows

Korea and Japan (the Ryukyu Island) as areas this species occurs. On the beside of that map, the author could not find out any report on the species *R. sanguineus* inhabitation in Korea.

Kohls(1950)²²⁾ presented its occurrence in the Philippines and at the same time Anastos(1950)²⁾ showed its distribution in the East Indies. Feldman-Muhsam(1952)¹¹⁾, 1956¹²⁾, 1964¹³⁾ reported on the identify, host specificity and laboratory colonies of *R. sanguineus* and the relative species in Israel. Subotnik(1956)³¹⁾, 1957³²⁾ gave the reasons for the geographical distribution limit of the tick *R. sanguineus* in Russia and Marutyán(1963)²⁴⁾ reported the occurrence of the species in Checheno-Ingush ASSR. Theis and Franti(1971)³⁶⁾ reported the changing infestation rates of the species on Singapore Island.

Hoogstraal(1956)¹⁴⁾ had already mentioned that the laboratory studies on the general biology of the species were rather complete and numerous biological and ecological questions remained to be answered. Thereafter, some ecological and physiological studies were done by Srivastava and Varma(1964)²⁹⁾, Ali and Sweatman(1966)¹⁾, Sweatman(1967)³⁴⁾, Sweatman and Koussa(1968)³⁵⁾ and Theis and Franti(1971)³⁶⁾.

The medical and veterinary importance of the species was also reviewed by Hoogstraal(1966)¹⁵⁾, 1967¹⁶⁾, Injeyan *et al*(1971)¹⁸⁾ and Balashov(1972)⁷⁾.

Scanning electron microscopy was used in the studies on the ifine structures of some protozoan parasites^{8,17,25,26,28,37,39)} and some extraordinary pictures on some ectoparasites were also reported^{8-5,39)}.

Making reference to the presence of *R. sanguineus*, a total of 20 species of ticks including some doubtful fossil records belonging to 8 genera has now been recorded to occur in Korea.

Summary

Rhipicephalus sanguineus (Latreille 1806) the brown dog tick, is one of the most widely distributed ixodid ticks in the world, however, there was no report for the discovery of the species in Korea.

Specimens unfed or partly fed were collected from the dogs rearing in the livestock farms and

the pastures near the farms located in Kyunggi-Do, Chungchong-Namdo, Cholla-Pukdo and Cheju-Do, in summer seasons during 1981 to 1984. The specimens were examined at the Institute of Veterinary Research in Anyang and were identified as *R. sanguineus*.

The morphological characteristics observed by

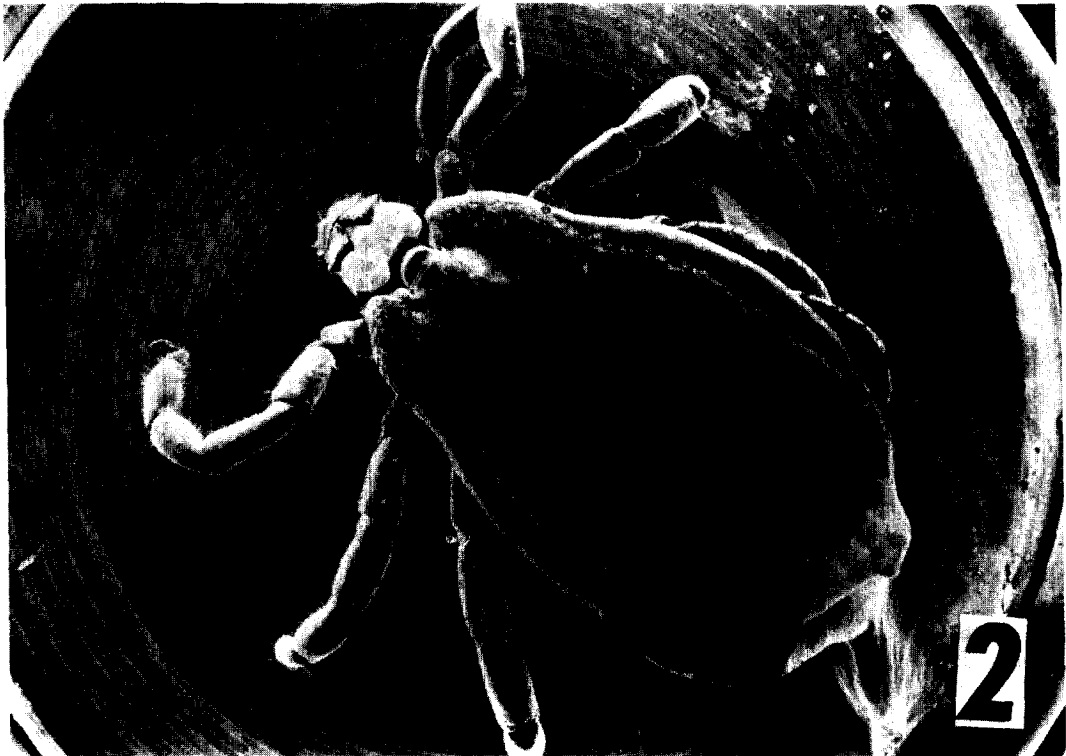
means of the scanning electron microscope were presented with some SEM microphotographs.

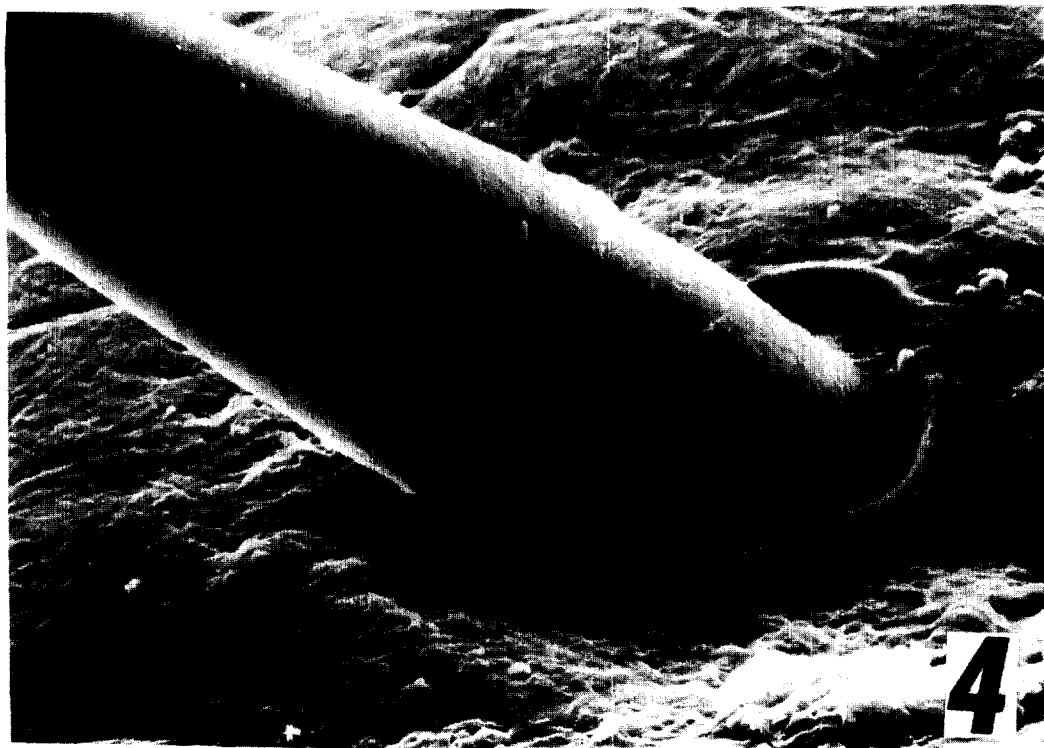
As *R. sanguineus* is firstly discovered to occur in Korea, a total of 20 species of ticks belonging to 8 genera, such as, *Argas*, *Amblyomma*, *Boophilus*, *Dermacentor*, *Haemaphysalis*, *Hyalomma*, *Ixodes* and *Rhipicephalus*, has now been recorded.

Legends for Figures

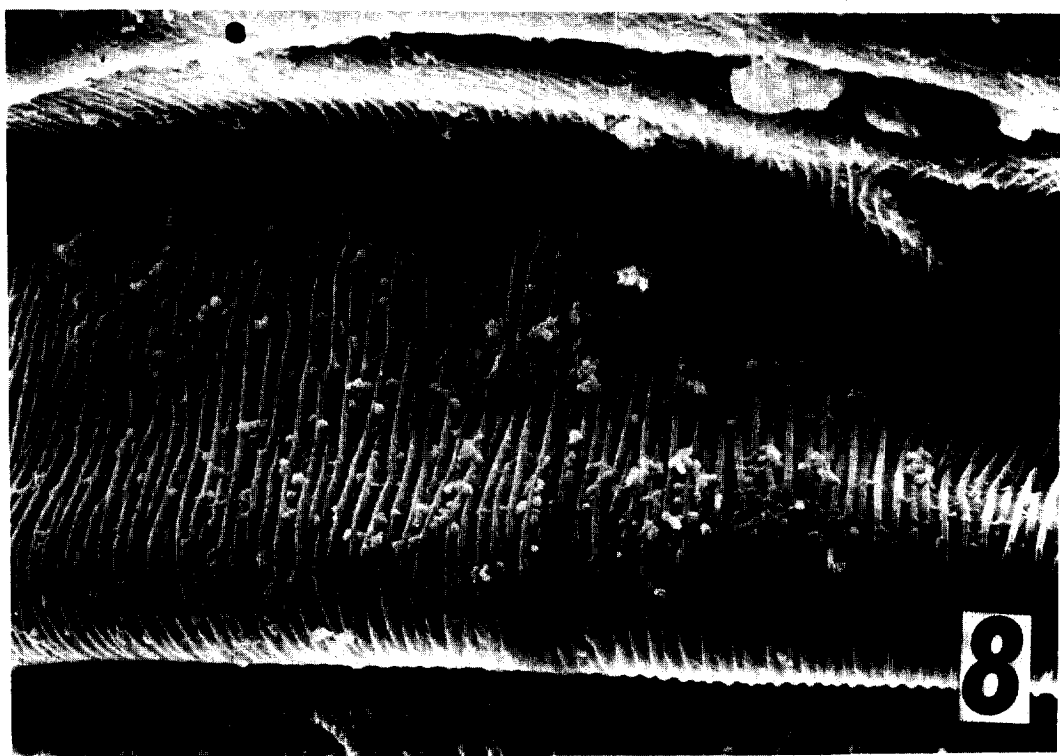
Rhipicephalus sanguineus (Latreille 1806), Male specimen. Scanning Electron Microscopy (ISI-DS-130, 15KV).

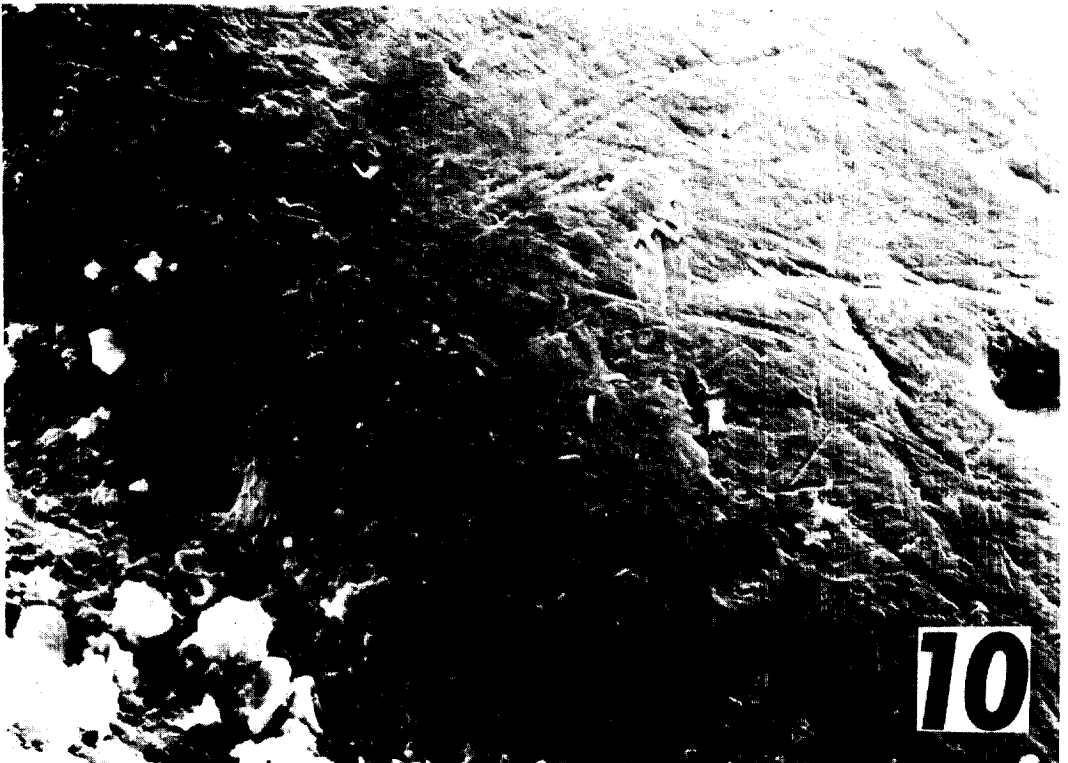
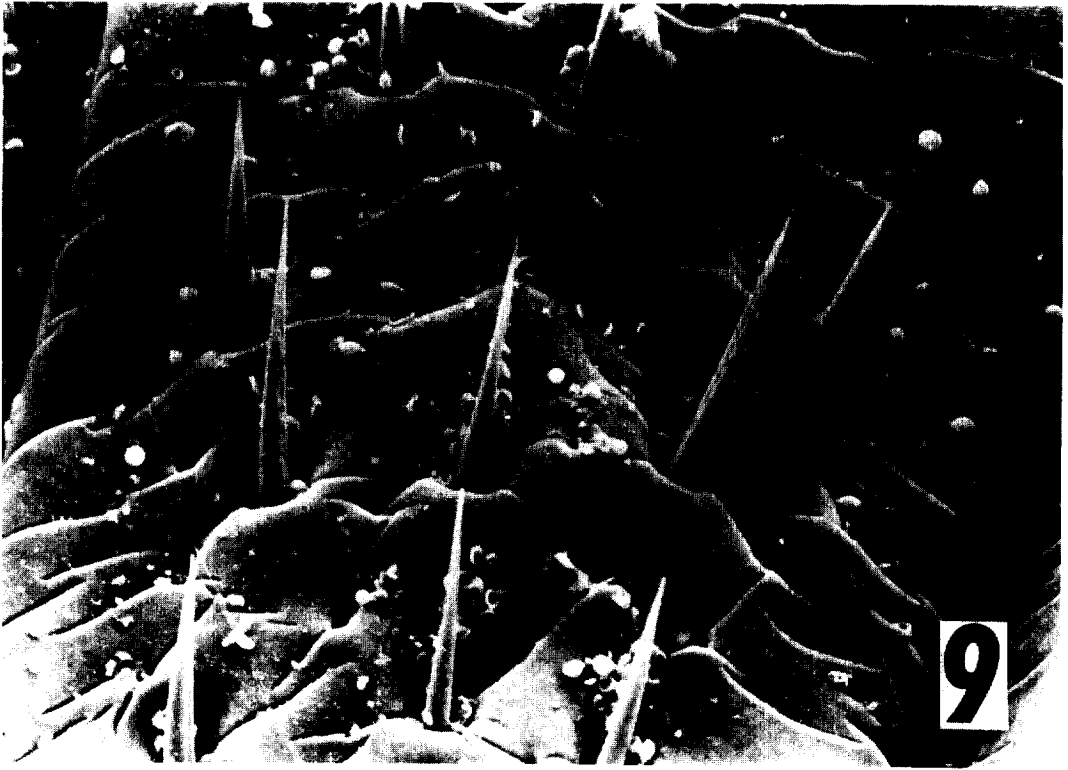
- Fig. 1.** Craniodorsal view of the body, showing the legs and head part. (16.6 ×).
- Fig. 2.** Dorsal view of the body, showing the legs, head part and scutum with grooves and punctations. (18.0 ×).
- Fig. 3.** Coccygeodorsal view of the capitulum, showing the pedipalps, hypostome and basis capitulum. (100 ×).
- Fig. 4.** Lateral view of the highly magnified seta on the capitulum. (3000 ×).
- Fig. 5.** Ventral view of the capitulum, showing the hypostome, articles, corona files and ventrointernal setae. (100 ×).
- Fig. 6.** Ventral aspect of the hypostome with the highly magnified corona and files. (1000 ×).
- Fig. 7.** Lateral view of the trochanter-femur joint of the right leg I and the coxa-trochanter joint of the right leg II. (100 ×).
- Fig. 8.** Surface of the leg with high magnification. (1500 ×).
- Fig. 9.** Ventral aspect of the setae on the abdominal part. (300 ×).
- Fig. 10.** Dorsal aspect of the punctations on the scutum with high magnification. (1000 ×).











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