

Takeda, Oishi, Fujiyama 1984

IBUTACHIA IITENNY
SHEETHS/ANNE
REVISION 10/84

BULLETIN OF THE IWATE PREFECTURAL MUSEUM, No. 2, p. 157-163, August, 1984

**A Record of Pliocene Cancrid Crab, *Cancer minutoserratus*
NAGAO, from the Yushima Formation, Iwate Prefecture,
with a note on Subgeneric Diversity of *Cancer* in Japan**

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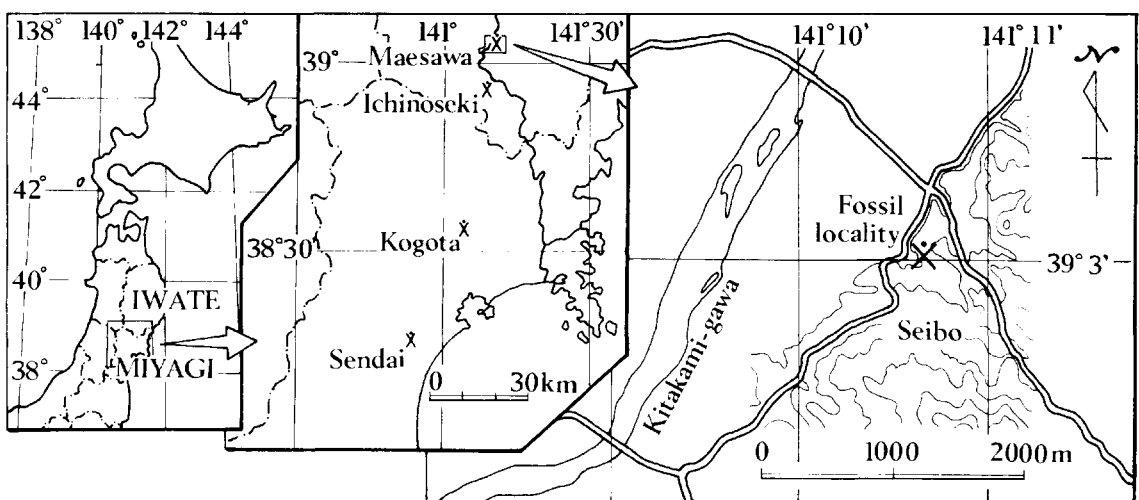
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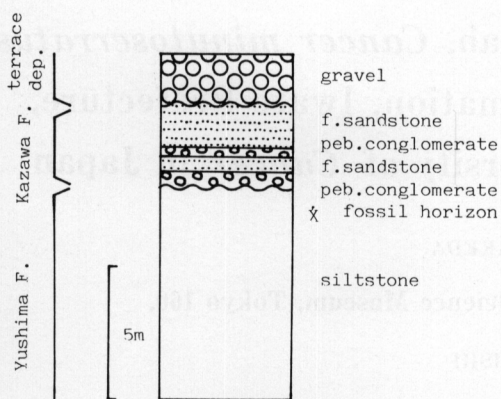
During 9 days from September 27 to October 5, 1982, staff members of the Iwate Prefectural Museum excavated whale bones of good preservation referable to an individual at Maesawa-cho, Iwate Prefecture, Northeast Japan. The results of the excavation with geological consideration and identification of the whale and associated fossils will be published in due time.

Many pieces of crab fossils found along

with the whale bones and other invertebrates were definitely identified as *Cancer minotoserratus* NAGAO of the family Cancridae. This species is, as to be noted in the following lines, known only from the Pliocene formations of Northeast Japan, representing the interesting data for the subgeneric diversity and dispersal of the genus *Cancer*. All the specimens dealt with in the present paper are deposited in the Iwate Prefectural Museum.



Text-fig. 1. Maps showing the known localities of *Cancer minotoserratus* NAGAO, and map of Maesawa-cho to show the fossil locality.



Text-fig. 2. Columnar section of the fossil locality.

Pleist.	Takizawa F.	40m
Pliocene	Mataki F.	50m
	Kazawa F.	80m
	Yushima F.	50m
	Ariga F.	40m
Miocene	Genbi F.	
	Itsukushi wld.tf.	100m
		150m
	Tsukumo ss.	100m
	Shimokurosawa F.	200m
	Junijin ss.	80m
	Jikyozan Andesite	300m

Text-fig. 3. Stratigraphic sequence of the southern part of Ichinoseki region (after KITAMURA, 1981).



Text-fig. 4. Carapace of *Cancer minutoserratus* NAGAO exposed by the side of whale bones in the field.

Occurrence and Geology

The fossils were collected from the bluish gray massive siltstone of the Yushima Formation (HAYAKAWA *et al.*, 1954), exposed at road-

side cutting, at Seibo, Maesawa-cho, the western margin of the Kitakami Mountains, Northeast Japan (text-fig. 1). The formation is unconformably overlain by the Kazawa Formation (HAYAKAWA *et al.*, *op. cit.*), composed of con-

glomerate and sandstone at the locality (text-fig. 2). A number of fossil crabs were found associated with various kinds of fossils such as whale bones, molluscan shells, seastars and plant fragments, etc. The carapaces and chelipeds were buried in positions parallel with the horizontal laminae poorly developed in the siltstone.

The Yushima Formation in this area had previously been named as the Koromogawa shell beds by SHIMAKURA and TSUCHIDA (1939), whereas HAYAKAWA *et al.* (1954) later included it in the Yushima Formation extensively distributed in the southern part of Ichinoseki region (text-fig. 3). The formation is paleontologically and stratigraphically correlated with the early Pliocene Tatsunokuchi Formation (HANZAWA *et al.*, 1953), distributed in the environs of Sendai City, Miyagi Prefecture (ONODERA, 1957; KITAMURA, 1981; and others).

Description

Family Cancridae

Genus *Cancer* LINNAEUS, 1758

Cancer minutoserratus NAGAO, 1940

(text-figs. 4-6)

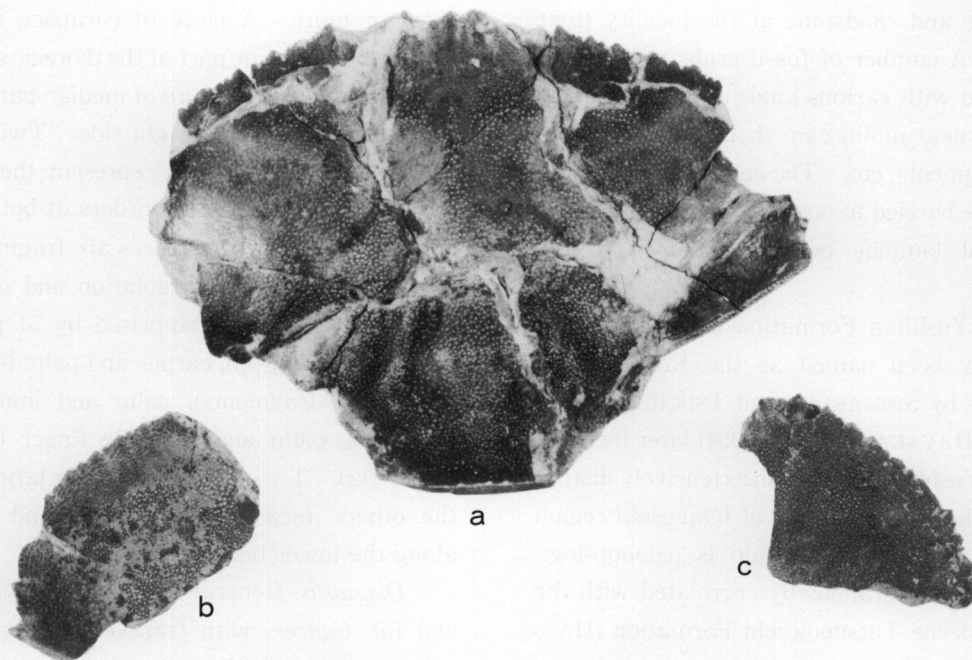
NAGAO, 1940: 69-72, pl. 23 (Hyojogawara, Sendai, Miyagi Pref.).—IMAZUMI, 1962: 243 (Tatsunokuchigorge, Sendai; Kogota, Miyagi Pref.; Ichinoseki, Iwate Pref.).

Material examined. A total of 74 pieces of carapaces, chelipeds and ambulatory legs. One of the carapaces in a block of silty rock is broken into several parts, but useful to get the information about the general shape and size, the surface ornamentation, and the armature of the frontal and anterolateral borders except for the posterior halves of both sides; length of the carapace is about 6 cm, and breadth may attain

8 cm or more. A piece of carapace is associated with anterior part of the thoracic sternum and represents the nature of median part of the anterolateral border of right side. Two pieces of carapaces sufficiently represent the armature of the anterolateral borders of both sides. Other specimens of carapaces are fragmentary, representing only the areolation and granulation. Chelipeds are comprised by 51 pieces; merus (1), carpus (3), carpus and palm (4), palm (20, and 4 fragments), palm and immovable finger (6), palm and movable finger (1), and finger (12). Two palms are much larger than the others, measuring about 3.7 and 3.3 cm along the lower border.

Diagnosis. General shape of carapace typical for *Cancer*, with transversely ovate contour; dorsum weakly convex in both directions, indistinctly areolated, and covered with fine granules which are almost uniformly dispersed, but more or less prominent on areolae. Front tridentate, the median tooth being a little narrower and apparently exceeding each lateral one. Anterolateral teeth except for last tooth at lateral angle of carapace broad triangular, with tip directed obliquely forward, being separated from one another by small V-shaped notches and closed fissures; margin of each tooth irregularly serrated with fine serrulations by granules, and sometimes subdivided into two or three parts in larger specimens; last tooth narrowly triangular, sharp and directed obliquely forward.

Chelipeds heavy. Carpus smooth with a strong tubercle at its inner angle and a subsidiary smaller one below the main one, being bordered with a band of close-set granules; upper surface with two ridges, one from articulation with palm to median part of inner border and the other from median part of proximal border to central part of upper surface. Palm longer than high, and its outer surface orna-



Text-fig. 5. Fossil remains of *Cancer minotoserratus* NAGAO. a, Carapace. b, Left anterolateral part. c, Right anterolateral part. IPMM 40070 $\times 1$.

mented with five longitudinal, granulated ridges; the first or uppermost sharp, but markedly strong; the second longer than the first and as long as the third or median, curving upward at its distal part; the fourth and fifth or lower two extended onto immovable finger along cutting edge and lower border, respectively; upper border of palm sharply serrated with several pointed teeth of small variable size. Movable finger minutely but sharply serrated on its upper border; both fingers curving inward distally.

Remarks. The original description is good for the subsequent identification and right in comparing it with *C. plebejus* POEPPING from the west coast of South America as a nearest kin. The present species is also somewhat similar to *C. edwardsii* BELL from the west coast of South America and *C. novaezealandiae* (JACQUINOT) from New Zealand, in which the serration of the anterolateral teeth is much

more distinct.

The genus *Cancer* LINNAEUS, 1758, was extensively revised by NATIONS (1975) based on the recent and fossil specimens, who recognized four subgenera, *Cancer* s. s., *Romaleon* GISTL, 1848, *Metacarcinus* A. MILNE EDWARDS, 1862, and *Glebocarcinus* newly erected. Afterwards, TAKEDA (1977) discussed the systematic status of the genus *Platepistoma* RATHBUN, 1906, and reduced it to subgeneric rank of *Cancer*, and thus *Platepistoma* replacing *Glebocarcinus* on the basis of priority.

C. minotoserratus recorded in the present paper is characteristic in the formation of the serrulated anterolateral teeth and without doubt included in the subgenus *Metacarcinus* along with 15 species referred by NATIONS (*op. cit.*). In addition to the close relatives, *C. plebejus*, *C. edwardsii*, and *C. novaezealandiae* of the same subgenus, *C. bellianus* JOHNSON from the northeastern Atlantic and *C. borealis*