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12. On the Occurrence of *Katroliceras* in the Tetori Series.

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(Contribution from the Geological Institute, Imperial University of Tokyo.)

[With Pl. XII.]

In 1904 YOKOYAMA¹⁾ described six species of Ammonites from the Kaizara beds in the province of Echizen, and concluded that "to what part of the Malm this ammonite-bed belongs is at present difficult to say, but probability points to its lower part or Oxford." Although our knowledge on the stratigraphy of the Tetori series and the flora has since been greatly expanded, little light has been thrown on the Tetori ammonites with the exception of the discovery of Callovian *Seymourites* in the Yambara bed below the Kaizara.²⁾ Under such circumstances a description of *Katroliceras* from Kaizara may be of value because its closest ally is *K. pottingeri* from the middle Katrol group in Katch.

Genus *Katroliceras* SPATH, 1924.

1924. *Katroliceras* SPATH, On the BLAKE Collection of Ammonites from Kachh, India. Pal. Ind. N. S. vol. 9, Mem. no. 1.
1931. *Katroliceras* SPATH, Revision of the Jurassic cephalopod fauna of Kachh (Cutch). Pal. Indica, New Ser. vol. 9, Mem. 2, p. 470.
1934. *Katroliceras* DACUQÉ, Wirbellose des Jura in GÜRICH's Leitfossilien, p. 358.

SPATH established this genus in the Virgatosphinctinae on the basis of SOWERBY's *Ammonites pottingeri*, a very distinctive Katch species, saying:

"The group of *A. pottingeri*, SOWERBY, "*Peris.*" *katrolensis*, and "*P.*" *euplocus*, WAAGEN, with very depressed inner whorls, is here separated as *Katroliceras*, gen. nov. (genotype: *A. pottingeri*, J. DE C. SOWERBY, 1840, p. 183, pl. 61, fig. 1, B. M. No. 10076, Geol. Soc. Coll., wrongly compared by D'ORBIGNY (Prodrome, I, p. 329) to the Peltoceratid, *A. chauvinianus*)."

* This is a product of the studies on the Jurassic System of Nippon which the senior author is now undertaking with the grant given to him from the Hattori-Hoko-Kai.

1) M. YOKOYAMA (1904), Jurassic Ammonites from Echizen and Nagato. *Journ. Fac. Sci. Imp. Univ. Tokyo*, vol. 19, art. 20.

2) T. KOBAYASHI (1935), Contributions to the Mesozoic Faunas of Japan. *Journ. Geol. Soc. Tokyo*, vol. 42.

Later he mentioned that "The group which has a long range and probably includes the well-known European *K. crusoliense* (FONTANNE) is connected with its close allies, *Torquatisphinctes* and *Pachysphinctes*, by various passage-forms. The inner whorls are very similar in the two stocks which may be traceable to *Biplices*, but *Katroliceras* typically is evolute and the whorl-section is depressed whilst the biplicate ribbing is always sharp, coarse and often distant always at an early stage. In the more typical form the characteristic change of the ornamentation (which distinguishes it from the less specialised *Subdichotomoceras*) may take place while the whorls are still septate and the sharp ribs greatly project-laterally. Complete specimens, on account of their typical body-chambers are thus easily recognised, but in *K. euplocum* (WAAGEN), the holotype of which is malformed, it is mainly the lateral projection of the primaries that suggests generic separation from the somewhat similar *Pachysphinctes symmetricus*. Again *Katroliceras lerense* connects directly with *Pachysphinctes orientalis*, but inner whorls of both forms may easily be mistaken for *Subdichotomoceras*."

On this occasion he described 12 species and 5 varieties, including SOWERBY, WAAGEN and SPATH's *pottingeri* which was split into four species and two varieties. Although the authors have not yet had access to SOWERBY's reference,³⁾ SPATH mentions that—"SOWERBY's diagrammatic figure is reduced and the holotype is not nearly so well preserved as the illustration suggests so that a photographic reproduction would be of little use."

He therefore illustrated FUTTERER's Mombasa form which is, according to him, correctly identifiable with SOWERBY's species.

Compared with this East African form the European *crusoliense*⁴⁾ which BEURLIN⁵⁾ referred to *Divisosphinctes* is fairly distinct in its sub-circular whorl-section and mode of ornamentation. DACQUÉ on the other hand placed *Katroliceras* in *Perisphinctes*, instead of *Virgatosphinctes* or *Virgatiten*.

Katroliceras Yokoyamai KOBAYASHI and FUKADA, new species.

Plate XII, Figures 1a-1e.

Description.—Spire fairly evolute, the ultimate whorl embracing only the peripheral portion of the penultimate whorl; umbilical breadth occupies about nine-tenths of the shell-diameter. Primary rib with subvertical

3) J. DE C. SOWERBY (1840), In Sykes,—A Notice Respecting some Fossils collected in Kutch, *Trans. Geol. Soc. London*, (2), vol. 5, p. 719, pl. lxi, fig. 10 and explanation of plate.

4) P. DE LORIOU (1877), Monographie paléontologique des Couches de la Zone à Ammonite *Tenuilobus*. *Mém. Soc. Paléont. Suisse*, vol. 4, p. 53, pl. 5, figs. 6-8.

5) K. BEURLIN (1926), Über *Perisphinctes bifurcatus* etc. *Neuse Jahrb. f. Min. Beil.-Bd.* 52 B.

lateral sides and rounded top, increasing its height from the umbilical side, becomes most prominent at the mid-height of the whorl whence it bifurcates or trifurcates toward the periphery; in the penultimate whorl a primary rib is commonly trifurcate and in addition, a secondary rib is occasionally inserted while in the ultimate whorl a primary rib is more commonly bifurcate than trifurcate and a secondary which is more obsolete than that in the penultimate whorl is inserted. The ribs run across the ventral side without any interruptions.

Observations:—The features of the ornamentation can be seen from this specimen, but because it is secondarily compressed laterally it is impossible to describe the original shape of its whorl-section. It should be noted here however that the umbilical wall may have been subvertical and that the other side was gently and probably broadly rounded. The ventral one-sixth or so of the penultimate whorl appears to be enclosed by the ultimate one.

The following dimensions are estimated by restoring the missing portions on the basis of the remaining one-third of its shell.

Diameter of the shell	Ca. 96 mm.
Height of the last whorl	20 mm.
Umbilical breadth	Ca. 57 mm.
The ratio of the diameter to the thickness	1.08:1.

On the penultimate whorl the primary rib is generally trifurcate and between two sets of the secondaries thus produced there is a rib which is as long and as prominent as the secondaries, but one of these inserted ribs is seen to extend inward beyond the mid-height of the whorl.

On the internal mould of the last whorl it can be clearly seen that the primary rib more commonly bifurcates than trifurcates. When it bifurcates, the primary rib continues to two secondaries without interruption; when it trifurcates, only the median one extends directly and the two lateral ones become obsolete at their roots. The inserted ribs between the two sets of these secondaries are very obscure on the lateral side but as distinct as the secondaries on the ventral side.

In the replica of the same whorl taken from the external mould, the trifurcation is distinctly shown on a primary rib which bifurcates in the internal mould, and an inserted rib can clearly be seen on the lateral side where it is not seen in the internal mould. This probably is due to the difference in the thickening of the shell among these ribs.

Though more or less deformed secondarily, the ribs on the penultimate whorl appear more or less sigmoidal, being convex forward on the umbilical side and less distinctly concave on the other side, while those on the ultimate whorl are somewhat convex forward. On glancing at the specimens, especially the internal mould, the elevation of the rib appears to be a node but close observation, especially on the replicas, shows that the elevation, though prominent, inclines in- and out-ward gradually.

In a quarter of the penultimate whorl there are about five primaries and intervals of the same number whereas there are about seven primaries and intervals in a quarter of the last whorl. The breadth of the interval between two primary ribs is fairly constant on the penultimate whorl but becomes quite irregular on the last whorl.

Comparison:—Because the specimen is laterally compressed secondarily, the section of whorl which one can now see, is much narrower than usual in *Katrolicerias*, but still it can hardly be overlooked that the section through the primary rib has a subquadrate outline which is most expanded and subangulated at the elevation of the rib. Other characteristics, notably the evolute spire, and narrow and prominent ribs, show that this species is diagnostic of the genus.

Unfortunately the juvenile portion of the spire is not preserved in the Tetori form and hence nothing can be mentioned of its ontogeny. It is known, however, that the ribs are mostly trifurcate in the penultimate whorl which is the earliest stage preserved on this specimen. Compared with the Mombasa form of *K. pottingeri* (Pl. XII, fig. 2) the volution expands more rapidly and accordingly the umbilicus is much broader in this species. With regard to curvature and height the penultimate whorl of this specimen is comparable to the early part of the ultimate whorl of the Mombasa form (SPATH, 1931, pl. 102, fig. 5) where primary ribs are bifurcated. But if the different rate of coiling is taken into consideration this part of the specimen must be compared with the latter part of the ultimate whorl of the Mombasa form. In this stage of growth the two forms well agree with each other in the trifurcation of the rib at the mid-length and occasional insertion of a short rib between two primaries.

If the ultimate whorl of this specimen is compared with the more grown stage of the Mombasa form as shown by the specimen in fig. 5c., it is found that the characteristic branching of the rib is still fairly well maintained in the Japanese form whereas the inserting ribs are more developed in the Mombasa form. Furthermore it is a distinct difference that the primaries are more widely spaced in the latter form than in the former. This distinction also applies to WAAGEN's *Perisphinctes pottingeri*⁶⁾ from the Katrol sandstone for which SPATH proposed a new name, *Katrolicerias waageni*.

This form can easily be distinguished from *Katrolicerias katrolense* and its allies which have more slender ribs, as well as from *K. lerense* and its allies in which the rib becomes very coarse and at the same time the point of its branching shifts close to the periphery. As a result of all of these comparisons the authors have reached the conclusion that this is a new species of ammonite which, however, is evidently congeneric

6) W. WAAGEN (1875), Jurassic Fauna of Kutch. *Pal. Indica*, vol. 1, pt. 4, p. 184, pl. liii.

with *K. pottingeri*. Though the specimen is incomplete, it bears diagnostic aspects of *Katroliceras* s. str. The new name, *Katroliceras yokoyamai*, is proposed here for it in honour of the late Prof. M. YOKOYAMA who described the ammonite of this locality.

Occurrence.—The specimen was donated to our Institute in 1935 through the senior author by Mr. G. TANIGUCHI, a farmer at Kaizara, Ishido-shiromura (?), Ono-gun, Province of Echizen, which is a well known locality of Jurassic ammonites. Because it was found as a boulder, its exact horizon is unknown but undoubtedly it was derived from somewhere in the Kaizara beds. Incidentally it should be noted that *Katroliceras pottingeri* to which it is closest occurs in Katch in a horizon of the Middle Katrol group which SPATH considered to be Middle Kimmeridgian.

Explanation of Plate XII.

Katroliceras yokoyamai KOBAYASHI and FUKADA

Figure 1a. Lateral view of the internal mould.

Figure 1b. Replica taken from the external mould.

Figure 1c. Ditto.

Figure 1d. Ventral view of the internal mould.

Figure 1e. Cross section of the last whorl. All natural size.

Tetori Series, at Kaizara, Upper Kuzuryu Valley, Province of Echizen.

Katroliceras pottingeri (SOWERBY)

Figure 2. FUTTERER'S Mombasa specimen.

