

## *Nuculoma wynnei* Cox from the Jurassic of Kutch (Gujarat)

S K AGRAWAL<sup>1</sup> and R P KACHHARA<sup>2</sup>

<sup>1</sup>Department of Geology, Banaras Hindu University, Varanasi 221005 and

<sup>2</sup>Department of Geology, University of Rajasthan, Station Road, Udaipur 313001

(Received 20 April 1979; after revision 24 July 1980)

*Nuculoma wynnei* Cox and *Nuculoma blakei* Cox have been found to be conspecific. The conclusion is based on the consideration of morphological characters as also the statistical analysis. The former name has priority over the latter.

**Keywords:** Jurassic, *Nuculoma wynnei*, *N. blakei* intergrading, Biometrics, Conspecific

### Introduction

Only two species of *Nuculoma* Cossmann, viz. *N. wynnei* Cox and *N. blakei* Cox (1940, pp. 23-25, Pl. I, figures 29-31 and 24-28) have hitherto been described from Kutch. While studying the faunas from Jhura dome, Agrawal (1956, pp. 53-54) recorded a well preserved left valve as *N. aff. blakei* (Pl. VII, figure 4), which to some extent has a combination of characters of these two species. It was thought to be an intermediate form but it could not be ascertained for want of sufficient material. Studies on subsequent collections from the east and west of the village of Ler (23°11'53" N : 69°48'10" E) and Habo Hill (Agrawal 1956, figure 2) have thrown considerable light on the specific status of the two species in question.

### SYSTEMATIC PALEONTOLOGY

Class: BIVALVIA Linné

Order: NUCULOIDA Dall

Superfamily: NUCULACEA Gray

Family: NUCULIDAE Gray

Genus: *Nuculoma* Cossmann

*Bull. Soc. Agric. Let. Sci. Arts Haut-Saone*,  
1907, reprint p. 56

Type-species—*Nucula castor* d'Orbigny,  
1849; by monotypy. Callovian; France

*Nuculoma wynnei* Cox

(Figures 1-11)

1940. *Nuculoma wynnei* Cox, p. 23, Pl. I,  
figures 29-31.

1940. *Nuculoma blakei* Cox, p. 24. Pl. I,  
figures 24-28.

1956. *Nuculoma blakei* Cox : Agrawal, p. 53.

1956. *Nuculoma aff. blakei* Cox : Agrawal,  
p. 54, Pl. VII, figure 4.

1956. *Nuculoma wynnei* Cox : Agrawal, p. 54.

*Material*

Innumerable specimens, of which only eighty

have been randomly selected for statistical analysis.

**Occurrences**

Callovian of the following localities:

*Sample A:* Keera, Kaora (Cox, *loc. cit.*)—three specimens; Jhura dome (S K Agrawal Coll., B.H.U.)—two specimens; Habo hill (S Kanjilal Coll., BHU)—eighteen specimens; east of Ler (R P Kachhara Coll., University of Rajasthan)—seven specimens; west of Ler (A K Saxena Coll., University of Rajasthan)—ten specimens.

*Sample B:* Jumara, Keera, Kaora (Cox, *loc. cit.*)—ten specimens; Jhura dome (S K Agrawal Coll., BHU)—one specimen; Habo hill (S Kanjilal Coll., BHU)—eleven specimens; east of Ler (RP Kachhara Coll., Univ. of Rajasthan)—nine specimens; west of Ler (AK Saxena Coll., Univ. of Rajasthan)—nine specimens.

**Description**

Shell-form and size widely variable; ovately trapezoidal or trigonal in outline; antero-dorsal profile is straight or arched while the margin is strongly and more or less symmetrically curved. Ventral margin evenly convex but sometimes slightly sinuate towards its posterior end. Anterior margin

strongly and somewhat symmetrically convex, meeting the antero-dorsal and ventral margins in even curves of variable obtuseness. The posterior margin is very steep to nearly vertical and meets the ventral margin in an obtuse angle. The shell is strongly inflated. In general, its size is fairly large for the genus and, on an average, the ratio of length to height is about 5:3.

Umbones strongly incurved, opisthogyrous, and almost terminal; umbonal region well inflated. Antero-dorsal area ill defined but umbonal ridges are absent. Escutcheon well defined, heart shaped, deeply impressed and limited by distinct angulation produced by umbonal ridges, and with a slight pouting of its marginal region. Shell surface, except in dorsal area, bears fine, raised concentric threads.

Dentition taxodont. Teeth arranged in long anterior and short posterior series consisting of 20–23 and about half a dozen in number respectively. They are exceptionally large and thick at the anterior end, decreasing regularly in size towards the umbones. The teeth of the posterior series are long and rather sinuous. One or two thick and prominent “chondrophore teeth” in both valves, which lie below the end teeth of the anterior row. The chondrophore is sub-horizontal.

*Dimensions*

	<i>Length</i>	<i>Height</i>	<i>Inflation</i>
(i) G S I Type No. 16514 (Holotype of <i>N. wynnei</i> )	17.5 mm	13.2 mm (75.4%)	13.2 mm (75.4%)
(ii) G S I Type No. 16516 (Holotype of <i>N. blakei</i> )	24.0 mm	15.0 mm (62.5%)	17.0 mm (70.8%)
(iii) G S I Type No. 16517 (Paratype of <i>N. blakei</i> )	26.0 mm*	16.0 mm (61.5%)*	16.3 mm (62.7%)*

\*These measurements according to Cox (1940, p.25) are for the holotype which, in fact, is smaller than the paratype for which these figures stand. The actual dimensions for the holotype are given in row (ii).

In general, the length ranges between 9.0 mm to 26.0 mm, height between 6.3 mm to 16.6 mm, and inflation between 5.7 mm to 16.4 mm.

#### Remarks

The two species in question were distinguished by their author on the basis of their form ("*N. wynnei* Cox" being less elongated), "the obtuse angle between posterior and ventral margins", and the sinuosity of the ventral margin (more pronounced in "*N. blakei* Cox"). Besides, Cox observed that "the two forms do not appear to intergrade". But length to height ratio in one of the paratypes (GSI No. 16518) of *N. blakei* (Cox, 1940, Pl.I, figure 28) approaches that of *N. wynnei*. In another paratype (GSI No. 16520; Pl.I, figure 27) the ventral margin is not sinuate. Moreover, the well preserved left valve from Lower Habo Series of Jhura dome, which has been referred to as *N. aff. blakei* (Agrawal, *loc. cit.*), is less elongate as compared to a typical shell of *N. blakei*. On the other hand, the characters like slightly convex posterior margin and absence of sinus towards posterior end show its nearness to *N. wynnei*. Thus, it possesses the characters which are somewhat intermediate between *N. wynnei* and *N. blakei*.

Likewise, a good number of specimens collected from the east as well as west of the village of Ler and Habo hill (Kanjilal collection) shows a combination of characters of the two species under consideration.

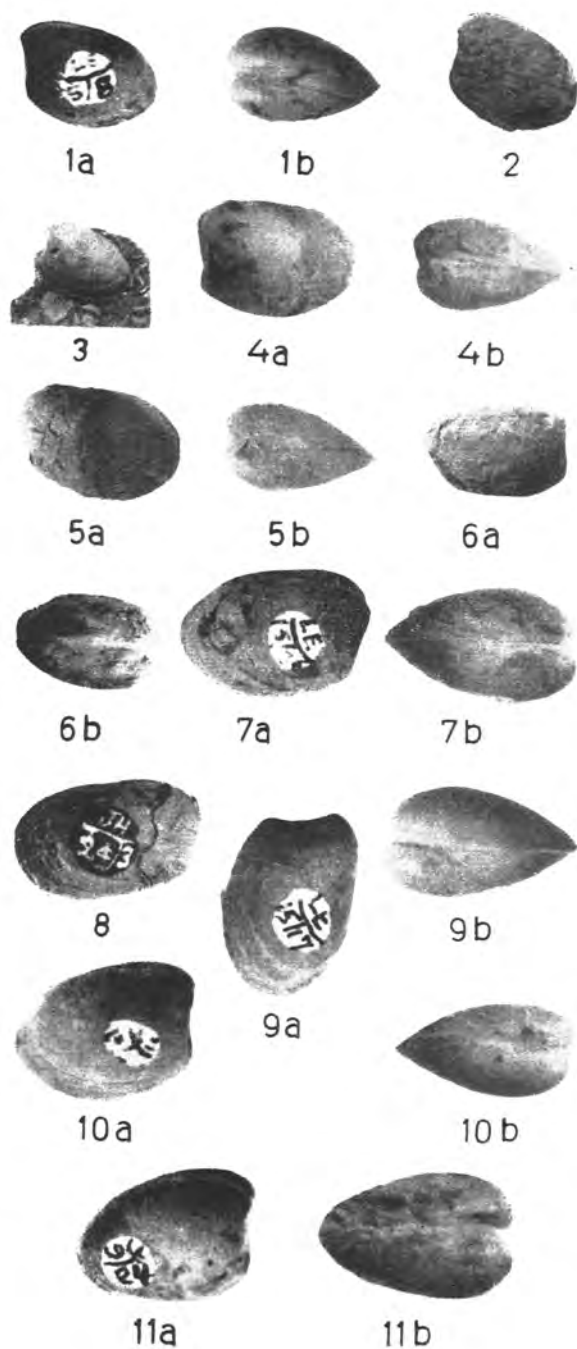
About twenty-four specimens (particularly specimen Nos. LE/5/8, BA/F, L/9/24, KA/S<sub>1</sub>/8; figures 1,2 and 11) are like typical *N. wynnei* in having trigonally ovate outline, length to height ratio about 4:3, strongly convex antero-dorsal profile, and flat or slightly concave posterior margin. On the other hand, twenty specimens (particularly

JH/24/3; figure 8) are characteristic *N. blakei* since they have elongate and trapezoidal outline, flattened antero-dorsal profile, the ratio of length to height well exceeding 3:2, sub-vertical or inward inclined posterior margin, and a sinus towards posterior end. Still many specimens (e.g. Nos. LA/131/11, LE/15/36 and LE/15/17; figures 4, 7 and 9) are having length to height ratio like *N. wynnei* but their inflation approaches that of *N. blakei*. Also, the specimens bearing GSI No. K/40/509 and one from those having GSI No. K/40/512, which are referred to *N. blakei*, have similar proportions. Further, a good series of specimens having almost similar inflation have in some cases (e.g. Nos. LE/15/52 & 70, LA/127/1, LA/131/33; figures 3 and 10) length to height ratio as in *N. wynnei* while in others (e.g. Nos. LA/131/10, LA/35/21, L/35/1, LE/15/30; figures 5 and 6) like that of *N. blakei*.

Although the obtuse angle between posterior and ventral margins has been considered by Cox (1940, p. 25) to be a distinctive character between *N. blakei* and *N. wynnei*, it is hardly discernible. This fact is borne out by carefully reading their original descriptions. Besides, a small specimen (No. LE/5/8; figure 1) from the east of the village of Ler, which corresponds well with *N. wynnei*, has this obtuse angle as mentioned for *N. blakei*.

The third feature of distinction, i.e. pronounced sinuosity of ventral margin, too, is not valid. Several specimens from the east and west of the village of Ler lack sinus towards their posterior end but otherwise match well with *N. blakei*.

Hence, in view of the above it is to be concluded that *N. wynnei* Cox and *N. blakei* Cox do intergrade and are not two distinct species. The former name having priority over the latter has to be retained for the



Figures 1-11 1, *Nuculoma wynnei* Cox—EU 2 (Callovian), East of Ler (No. LE/5/8, R P Kachhara Collection): (a) Exterior of a right valve, and (b) Dorsal view ( $\times 2$ ); 2, *Nuculoma wynnei* Cox—Lower Habo Series (Callovian), Jhura dome (No. BA/F, S K Agrawal Collection): Exterior of a right valve; 3, *Nuculoma wynnei* Cox—EU 2 (Callovian), East of Ler (No. LE/15/52, R P Kachhara Collection, Exterior of a right valve; 4, *Nuculoma wynnei* Cox—Habo Series (Callovian), West of Ler (No. LA/131/11, A K Saxena Collection): (a) Exterior of a right valve, and (b) Dorsal view ( $\times 2$ ); 5, *Nuculoma wynnei* Cox—Habo Series (Callovian), West of Ler (No. LA/131/10, A K Saxena Collection): (a) Exterior of a right valve, and (b) Dorsal view ( $\times 2$ ); 6, *Nuculoma wynnei* Cox—Habo Series (Callovian), West of Ler (No. LA/35/21, A K Saxena Collection): (a) Exterior of a left valve, and (b) Dorsal view (valves separated ventrally); 7, *Nuculoma wynnei* Cox—EU 2 (Callovian), East of Ler (No. LE/15/36, R P Kachhara Collection): (a) Exterior of a left valve, and (b) Dorsal view ( $\times 2$ ); 8, *Nuculoma wynnei* Cox—Lower Habo Series (Callovian), Jhura dome (No. JH. 24/3, S K Agrawal Collection): Exterior of a left valve; 9, *Nuculoma wynnei* Cox—EU 2 (Callovian), East of Ler (No. LE/15/17, R P Kachhara Collection): (a) Exterior of a right valve, (b) Dorsal view ( $\times 2$ ); 10, *Nuculoma wynnei* Cox—EU 2 (Callovian), East of Ler (No. LE/15/70, R P Kachhara Collection): (a) Exterior of a left valve, and (b) Dorsal view ( $\times 2$ ); 11, *Nuculoma wynnei* Cox—CU 2 (Callovian), East of Ler (No. L/9/24, R P Kachhara Collection): (a) Exterior of a left valve, and (b) Dorsal view ( $\times 2$ )

common form. This conclusion is further supported by multivariate analysis.

### Statistical Analysis

For analytical purpose the specimens referable to the group of these species in the material before the authors can be divided into two subgroups—A and B. The former is nearer to typical *wynnei* while the latter to typical *blakei*. Forty specimens of each subgroup have been randomly selected for statistical consideration.

Only three characters have been taken into account, viz. length ( $X$ ), height ( $Y$ ), and inflation ( $Z$ ). To know the equivalency of the above mentioned two species a null hypothesis is considered which states that the mean of the population from which the first sample was drawn is the same as the mean of the parent population of the second sample. In other words, *N. wynnei* and *N. blakei* have the same means. This hypothesis is subjected to 't' test taking that if calculated value of 't' exceeds the tabulated value at 10% level of significance (5% in each tail) the two samples, i.e. the subgroups A and B, are not drawn from a homogeneous population.

On the basis of statistics given in Table 1 't' values have been calculated differently for all the three characters by the following formula, i.e.

$$t = \frac{\bar{X}_1 - \bar{X}_2}{S_p \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

### References

- Agrawal S K 1956 Contribution à l'étude stratigraphique et paléontologique de Jurassique du Kutch (Inde); *Ann. Centre ét. document. paléontol.* **19**, pp. 188
- Cossmann M 1907 Paléontologie, in *Not sur le Callovien de la Haute—Marne, et spécialement*

where  $\bar{X}_1, n_1$  and  $\bar{X}_2, n_2$  are the means and number of observations of the respective sample. The quantity  $s_p$  is the pooled estimate of the population standard deviation. It can be found from the pooled estimated variance given by

$$s_p^2 = \frac{(n_1 - 1) s_1^2 + (n_2 - 1) s_2^2}{n_1 + n_2 - 2}$$

where  $s_1^2$  and  $s_2^2$  are the variances of samples 1 and 2 respectively.

The calculated 't' values for length, height and inflation are 1.037388, 1.335877 and 0.921607 respectively. The tabulated value of 't' is 1.684 which is higher than the calculated values. It is, therefore, to be inferred that the two subgroups A and B come from a single homogeneous population.

### Acknowledgements

The authors are much indebted to Professor J P Thapliyal for his helpful discussion and suggestions. Sincere thanks are due to Shri A K Saxena and Dr S Kanjilal for lending specimens from their collections, to the authorities of the Banaras Hindu University for necessary facilities to carry out the work, and to the Director General, Geological Survey of India, for permission and kindly providing facilities to study the material described by Cox.

- sur un gisement situé dans la commune de Bricon eds P Thiéry et M. Cossmann. 10-79 (Vesoul) (extrait du *Bull. Soc. agric. etc. Haute Saône*).
- Cox L R 1940 The Jurassic Lamellibranch fauna of Kuchh (Cutch). *Pal. Indica.* ser. IX, III (3), pp. 157