OCCURRENCE OF THE OSTRACOD GENERA QUADRACYTHERE AND HORNIBROOKELLA IN THE EARLY AND MIDDLE EOCENE ROCKS OF WESTERN SINDH, PAKISTAN

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Abstract

The communication reports the new record of occurrence of six species of the genus ***Hornibrookella*** (including two probable new species of the genus) and two species of ***Quardracythere*** recorded from the Paleogene of Southern Lower Indus Basin, Pakistan. These forms exhibit close similarity with the forms reported from Sulaiman Range, Pakistan, Kutch, India and Saudi Arabia.

Introduction

Siddiqui (1971) reported occurrence of the genus Quardracythere in abundance in the Paleogene sequence of Sulaiman Range. He treated ***Hornibrookella*** as subgenus of ***Quadracythere***; however Al- Furiah (1977) regarded ***Hornibrookella*** as an independent genus. Earlier Sohn (1959) reported only three species doubtfully belonging to the genus ***Quardracythere*** from the Southern Lower Indus Basin. Khosla (1972) regarded ***Quadracythere aspinosa*** Sohn (1959) as ***Anticythere memorons*** working on outcrop and core samples of Lakhra, Laki and Tiyon Formation of this area of Southern Lower Indus Basin, the authors have isolated a large number of specimen referable to these two genera.

The purpose of this communication is to report and describe the species belonging to the genera ***Quadracythere*** and ***Hornibrookella***. Three of the species described here are very distinct and did not compare with any of the species described in the literature available.

Material and Method

Material for this study was obtained from the borehole drilled in Lakhra Coal-field Sindh (Lat. 25° 49'N, Long. 68° 8' 30" E, Toposheet No: 40°c). The material of the Tiyon

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Formation was collected from Tiyon Dhoro Section (Lat. 26° 8' 30" N, Long. 67° 47' 15" E Toposheet No: 35 N) South of Jhangara Village and Thano Bula Khan area, District Dadu Sindh.

The stratigraphy of Paleocene and Eocene succession of Lakhra area and Tiyon Formation has bean dealt with by Williams (1959), Jones (1960), Iqbal (1973), Shah (1977) and has also been referred to by Usmani (1984), Usmani ***et al***. (1985) and Baryar and Ahmed (1986).

Briefly the succession is as under:

Kirthar Formation	Middle Late Eocene to Early Oligocene
Tiyon Formation	Lower Middle Eocene
Laki Formation	Early Eocene
(Laterite horizon at the base in Lakhra area)	
Lakhra Formation	Upper Paleocene
Bara Formation	Middle Paleocene
Khadro Formation	Lower Paleocene
Cretaceous	Disconfirmity Strata

Systematic Description

Order	PODOCOPIDA	Muller,	1894
Suborder	PODOCOPINA	Sars,	1866
Super family	CYTHERACEA	Baird,	1850
Family	TRACHYLEBERIDINAE	Sylvester-Bradely,	1948
Subfamily	TRACHYLEBERIDINAE	Sylvester-Bradely,	1948
Tribe	THAEROCYTHERINI	Hazel,	1967
Genus	HORNIBROOKELLA	Moos,	1965

Hornibrookella abdulrazzaqi Al-Furaih, 1983.
(Figs. 1a-c)

Reference: Al-Furaih, A.A.F., 1983, pp. 4,5, plate1,fig. 3-6

Remarks: The specimen under-description bears close similarity in all respects with ***Horbibrookella abdulrazzaqi*** Al-Furiah (1983).

Dimensions: (mm) Length 0.74, Height 0.41, Width 0.38

Distribution: This species has been isolated from Lakhra Formation (Upper

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Paleocene), AL-Furiah (1983) described it from Ummer Radhuma Formation (Upper Paleocene) of Saudi Arabia.

Hornibrookella arcana (Lubimoa & Guha)
(Figs. 2a-b)

Cythereis arcanus Lubimova and Guha 1960, p.33, pl.3, fig 1,a-b.
Quardracythere arcanus (Lubimova & Guha) Khosla, 1972,p.491,pl.2,fig.12
Quardracythere (Hornibrookella) arcana (Lubimova & Guha) Siddiqui, 971,pp.67,68,pl.34,figs 3-5.
Hornibrookella arcana (Lubimova & Guha) Al-Furaih, (1977) but differ in being arger in size anterior end obliquely rounded and ventral margin slightly sinuate.

Dimensions: (mm) Length 0.65, Height 0.35, Width 0.36

Distribution: This form has been isolated from Lakhra Formation (Upper Paleocene) and Laki Formation (Lower Eocene) of the Lower Indus Basin. This species was originally described by Lubimova and Guha (1960) from Lower Miocence of Kutch, India. Siddiqui (1971) has reported this from Lower Chocolate Clays (Mid-Eocene) of Rakhi Nala Section.

Hornibrookella episcelis Al-Furaih, 1977.
(Figs. 3a-b)

Reference: Al-Furaih, A.A.F., 1977, pp.492-494, plate 56, figs. 1-4, text fig.7

Remarks: The specimen under-description bears close resemblance with ***Hornibrookella episcelis*** Al-Furaih (1977) in all respects.

Dimensions: Length 0.75 mm, Height 0.34 mm

Distribution: This species has been isolated from the Lakhra (Upper Paleocene). Al-Furaih (1977) has described it from Lower Paleocene of Saudi Arabia.

Hornibrookella subquadra
(Figs. 4a-b)

Syn: Quadracythere (Hornibrookella) subquadra Siddiqui, 1971, pp.68-69, plate 34, figs. 6-11.

Remarks: The specimen under-description resembles with ***Quadracythere***

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(Hornibrookella) subquadra Siddiqui (1971) in all respects.

Dimensions: Male Length 0.65 mm Height 0.33 mm
Female Length 0.64 mm Height 0.40 mm

Distribution: This species has been isolated from the Laki Formation (Lowe Eocene). Siddiqui (1971) described it from Upper Chocolate Clays (Upper Eocene) of Za River Section.

***Hornibrookella* sp.1**
(Figs. 5a-b)

Description: Sexual dimorphism rather strong. Carapace subrectangular in later view with a distinct caudal process, anterior margin broadly rounded, posterodorsal slop slightly concave; dorsal margins straight, ventral curved posteriorly, dorsal and ventr margins nearly parallel. Left valve over- reaching the right in the region of posterodorsal slop and at anterior cardinal angle. Subcentral-tubercle present, covered by reticulation: eyetubercle rounded and distinct, surface deeply and coarsely reticulate, ventrolateral ridg distinct. Anterior marginal rim prominent continuing along the ventree and around th posterior margin as a less prominent rim; three to four denticles present on the posteric caudal region. Muscle scars in a vertical row of four elongate adductors and two frontal scar: Hinge holamphidont.

Remarks: The specimen under-description shows all the characters of the genu ***Hornibrookella*** Moos 1965. ***Hornibrookella subquardra*** earlier recorded a ***Quadracythere (Hornibrookella) Subquardra*** Siddiqui (1971), at the same time the for under-description is distinct from the known species in the specific characters. It bears som resemblance with ***H. subquadra*** Siddiqui (1971) but differ in the morphology of ventrum i the absence of short curved horn-like ridge at the postero-dorsal corner and the denticle from the anterior region. It also differs from ***Hornibrookella abdulrazzqi*** Al-Furaih (1983) the type of ridge on the ventral margin and mid-ventral area.

Dimensions: Male Length 0.65 mm Height 0.38 mm Width 0.35 mm
Female Length 0.64 mm Height 0.37 mm Width 0.36 mm

Distribution: Few specimens of this species has been isolated from Lakhr Formation (Upper Paleocene) of Lower Indus Basin.

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***Hornibrookella* sp.2**
(Fig. 6a-b)

Description: Carapace subrectangular, dorsal and ventral margins almost straight, anterior margin broadly rounded, produced into a blunt caudal process, postero-dorsal margin slightly concave, posteroventral margin rounded, ventral margin sinuate in the middle. Greatest length below the middle, greatest height at the anterior cardinal angle, greatest width anterior to the middle, valves unequal,left valve over-reaches the right along the postero-dorsal corner. Eye-tubercle distinct, subcentral tubercle not well-developed, surface coarsely and deeply reticulate; reticulae are concentrically arranged, dorsal ridge indistinct, ventral ridge present. A low marginal rim runs around the anterior and posterior margins. Sexual dimorphism apparent; males are longer and less wide than females.

Remarks: The specimen under-description is very distinct in its specific characters from all the known species of the genus. It resembles somewhat with ***Quardracythere (Hornibrookella)*** sp.*1* Siddiqui (1971), but differs in the presence of blunt and prominent caudal process, concave ventral margin and in the absence of dorsal ridge. It also differs from the ***Hornibrookella*** sp.*1* described herein earlier in the absence of dorsal ridge and posterior denticulations, arrangement of reticulae is also different.

Dimensions: Male Length 0.68 mm Height 0.33 mm Width 0.29 mm
Female Length 0.66 mm Height 0.34 mm Width 0.30 mm

Distributions: Few specimens of this species have been isolated from Laki Formation (Lower Eocene).

Quadracythere haquei Sohn (1959).
(Fig. 7)

Reference: Sohn, I. G. 1959, p.64, plate 1, figs. 16-19.

Remarks: The specimen under-description resembles ***Quadracythere haquei*** Sohn (1959) in all respects.

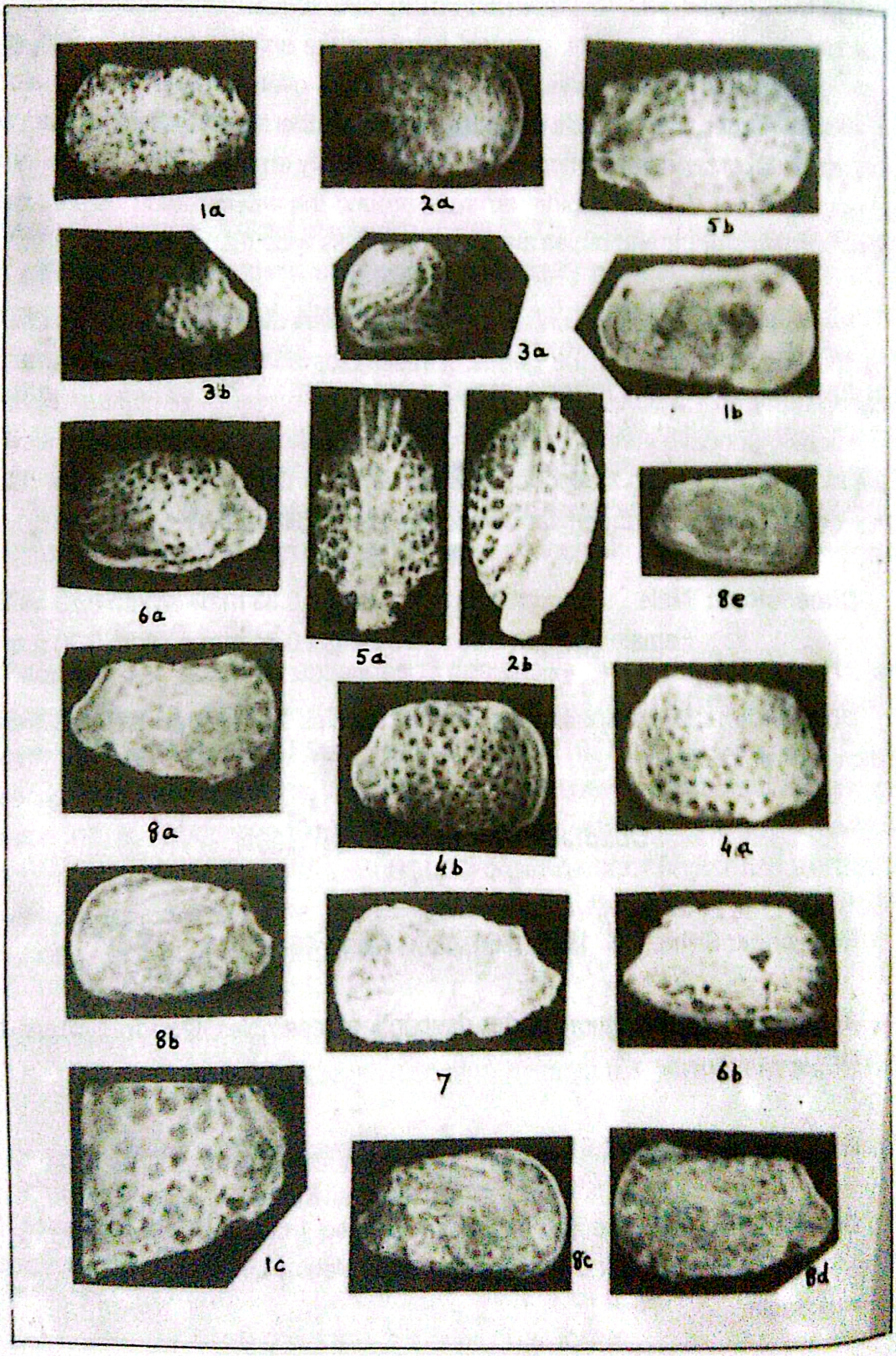
Dimensions: Length 0.61 mm Height 0.32 mm Width 0.28 mm

Distribution: This Species has been isolated from the Laki Formation (Lower Eocene). Sohn (1959) described this species from Meting Limestone (Lower Eocene) of Lower Indus Basin.

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Quadracythere thoerenensis
(Fig. 8a-c)

Syn: *Cythereis thoerenesis* Triebel, 1940. p. 195, plate 5,figs. 57-59.



Description: Carapace subrectangular with broad anterior margin, posterior pointed, dorsal and ventral straight and sub parallel, concavity at the posterio dorsal corner, anterior and posterior cardinal angles well developed, subcentral tubercle prominent with small tubercles. Eye tuberde prominent, anterior and ventral marginal rim high, surface, however, is not spinose, but strongly and subconcentrically punctate, ventral ridge covered by larger tubercles, short tubercles present on the dorsal ridge, anterior and posterior margin denticulate. Muscle scar pattern consists of four adductors and two frontal scars. Hinge holomphidont. Sexually dimorphic, males longer and less wide than females.

Remarks: The specimen under description shows all the distinctive features of the genus Quadracythere. However species characterized by all these features has earlier been described as ***C. thoerenesis*** by Triebel (1940). As the forms with these hinge features and muscle scar pattern have been placed in ***Quadracythere***, this author has therefore, accordingly placed it in ***Quadracythere***, while retaining Triebel's species name, renaming it ***Q. thoerenensis.***

Dimensions: Male Length 0.54 mm Height 0.24 mm Width 0.21 mm
Female Length 0.35 mm Height 0.23 mm Width 0.22 mm

Distribution: This species has been isolated from Lakhra Formation (Upper Paleocene) and also from Laki Formation (Lower Eocene). Triebel (1940) described it from the Lower Cretaceous of North Western Germany.

Discussion and Conclusion

This species belonging to the two genera ***Hornibrookella*** and ***Quadracythere*** recorded in this communication while emphasizing the distribution of the two genera added two new species of ***Hornibrookella*** and one new species of ***Quadracythere***. The report also redesignates the species ***Cytherels thoerenensis*** to the more appropriate ***Quadracythere thoerenensis***. Further the study helps in extending the stratigraphic ranges of the known species. The stratigraphic range of ***Quadracythere thoerenensis*** is expandable to Lower Eocene. Similarly range of ***Hornibrookella arcana*** is extended back to Upper Paleocene and also ***H. subquadra*** is extended back to Lower Eocene.

The comparable species from the various parts of India, Saudi Arabia and in the Sulaiman Range bear close resemblance and suggest marine connection and similar paleoecologic setting.

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Explanation of the plate

Fig. 1a-c **Hornibrookella abdulrazzaqi** Al-Furiah 1983, 1a-Left valve X 80; 1b-left valve internal view X 85, 1c-left valve showing fossae X 150 (Lakhra Fm)

Fig. 2a-b **Hornibrookella arcana** Al-Furaih 1977, 2a-right valve X 85; 2b-drosal view X 95 (Lakhra Fm and Laki Fm).

Fig. 3a-b **Hornibrookella episcelis** Al-Furaih 1977, 3a-left valve male X80; 3b-left valve female carapae, X 80 (Lakhra Fm).

Fig. 4a-b **Hornibrookella subquadra** Siddiqui 1971, 4a-left valve male X 80;4b-right valve female, X 80 (Laki Fm).

Fig. 5a-b **Hornibrookella** sp.1 5a-right valve external view X 95; 5b-dorsal view, X 95 (Lakhra Fm).

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