GEOLOGICA
International Journal of Earth Sciences
ISSN-Print: 1025-2541
ISSN-Online: 3006-967X

# ON A NEW NAUTILOID SPECIES EUTROPHOCERAS DRAZINDAI FROM EOCENE OF DRAZINDA FORMATION K.P.K, PAKISTAN

**Syed Iftikhar Husain Jarfi**[*1]

[1*] No. C-5, Commercial-1, Gulshan-e-Shamim, F.B. Area, Block 8, Karachi, Pakistan
*Corresponding Email: syediftikharhusainjafri@gmail.com



**Article History**
Received: 07-07-2026
Accepted: 08-07-2026
Available online: 04-09-2026

**Citation:** *Jafri S.I.H.*, 2026. On a new nautiloid species Eutrophoceras drazindai from Eocene of Drazinda Formation, K.P.K., Pakistan. Geologica v. 13, Article No. 4, https://geologica.gov.pk/*

## ABSTRACT:

A new nautiloid species, *Eutrephoceras drazindai* sp. nov., is described from the Drazinda Formation (Kirthar Group) of Khyber Pakhtunkhwa (K.P.K), Pakistan. The formation is of late Lutetian–Bartonian to Priabonian age (approximately 43.5–38 Ma) and the new species therefore represents a Middle to Late Eocene record. The holotype is a planispiral, involute shell with slightly sinuous external sutures. This is the first nautiloid species to be formally described from the Drazinda Formation of northern Pakistan and it extends the known distribution of Eocene nautiloids within the eastern Tethyan realm.

**Keywords:** Nautiloid, new species, *Eutrephoceras*, Eocene, Bartonian, Drazinda Formation, Khyber Pakhtunkhwa, Pakistan

## INTRODUCTION:

Fossil nautiloids and allied cephalopods have been reported widely from the Tethyan and circum-Pacific regions. Tongtherm et al. (2016) recorded nautiloid and ammonoid fossils from peninsular Thailand, while a new orthoceratoid species was described from the Ordovician of east-central Iran (Dastanpour et al., 2006). Jafri (2024) recently recorded seven genera of nautiloid cephalopods from various provinces of Pakistan. Kummel (1970) described ammonoids from the Mianwali Formation, Salt Range of Pakistan, and Tozer (1994) documented the Triassic ammonoid faunas of Canada. In a detailed report, LeBlanc (2019) recorded a large number of nautiloid species from Qatar. Halder (2012) reported nautiloid species from Kutch, western India, in which *Aturia gujaratensis* and *Deltoidonautilus vredenburgi* were erected as new species; Jurassic nautiloids of Kutch have likewise been studied in detail (Halder, 2000, 2012). Casadío et al. (1999) described Tertiary nautiloids from Patagonia, southern Argentina. Nielsen et al. (2009) examined the taphonomy and palaeobiogeographical provenance of *Aturia cubaensis* from Cenozoic deposits of Chile. Farouk et al. (2013) described the stratigraphy of the Middle Eocene–Lower Oligocene succession of northwestern and eastern Jordan. Fatmi et al. (1995) recorded Paleocene–Eocene nautiloids from Lakhra, Sindh, Pakistan. Mikuž and Bartol (2012) recorded a new cephalopod from Eocene beds of Istria, Croatia. Saunders et al. (1996) clarified the position of *Nautilus praepompilius* from the late Eocene of Kazakhstan, and a new species of *Deltoidonautilus* was recorded from the upper Eocene of western

ISSN-Print: 1025-2541
ISSN-Online: 3006-967X

Kyushu, Japan (Tanabe & Chiba, 1983). The present paper adds to this record by describing the first new nautiloid species from the Drazinda Formation of northern Pakistan.

## GEOLOGICAL SETTING:

Pakistan occupies the junction of the Indian and Eurasian plates. Balochistan and Khyber Pakhtunkhwa lie on the Eurasian side, forming part of the Iranian plateau margin, whereas the northern areas and Azad Kashmir follow the leading edge of the Indian plate (Wang et al., 2012). The Indo-Pakistan block rifted away from Madagascar in the late Jurassic, drifted northward through the Cretaceous, and its final collision with Asia near the Eocene–Oligocene transition produced the Himalayan orogen (Malkani, 2014). A stable Paleozoic platform, the Indian Shield, underlies the region and passes northward into the Himalayan foredeep. Marine lower Eocene strata are well exposed in the Sakesar Limestone of Nammal Gorge in the central Salt Range of Punjab (Ghazi et al., 2010).

The Drazinda Formation, the uppermost unit of the Kirthar Group, crops out near Drazinda town (District Dera Ismail Khan) in Khyber Pakhtunkhwa. Structurally it belongs to the Sulaiman fold belt, which forms a pronounced lobe in this sector; the lobe attains its greatest width at the study area (Powell, 1979; Kazmi & Rana, 1982) (Fig. 1).

Following the closure of the Tethys Sea and collision of the Indian and Eurasian plates roughly 55–60 million years ago, the subcontinent experienced repeated cycles of marine transgression and regression (Gingerich et al., 1979; Haq et al., 1987). The Drazinda Formation was deposited on a shallow Tethyan shelf during the Middle Eocene, an interval that includes the Middle Eocene Climatic Optimum (MECO), when elevated global temperatures and a marine transgression sustained warm, carbonate-rich shelf seas across the eastern Tethys. Pleistocene sediments flank the Sulaiman foothills (Kazmi & Rana, 1982; Humayun, 1990). Lithologically, the lower part of the formation consists of grey claystone with marl interbeds and is richly fossiliferous, while the upper part comprises limestone with abundant foraminifera, bivalves and echinoids (Hemphil & Kidwai, 1973).

## MATERIALS AND METHODS:

A single well-preserved specimen was collected from the Drazinda Formation near Drazinda town, District Dera Ismail Khan, K.P.K (31°43′03″N, 70°08′42″E (31.717541° N, 70.144968° E)). The specimen was recovered from the fossiliferous grey claystone–marl facies that characterises the lower part of the Drazinda Formation (see Geological Setting). It was washed, cleaned, measured and photographed for detailed study. Morphometric parameters follow standard nautiloid conventions: shell diameter (D), whorl height (WH), whorl width (WW), and umbilical diameter (UD).

### Repository:

The holotype is currently held in the personal collection of the author (S. I. H. Jafri) and has not yet been catalogued. In accordance with ICZN Articles 16.4 and 72.3, the specimen shall be formally deposited in the Pakistan Museum of Natural History (PMNH), Islamabad. Else, with the Geological Survey of Pakistan (GSP), Rawalpindi, designated as the alternative repository should PMNH deposition not be practicable.

## RESULTS:

### Systematic Paleontology:

Class: Cephalopoda Cuvier, 1795

ISSN-Print: 1025-2541
ISSN-Online: 3006-967X

Order: Nautilida Agassiz, 1847
Family: Nautilidae d'Orbigny, 1840
Genus: *Eutrephoceras* Hyatt, 1894
*Eutrephoceras drazindai* sp. nov.

**Holotype:**

The specimen figured herein (Figs. 2–5); by monotypy the sole known specimen of the species (repository details given under Materials and Methods).

**Type locality and horizon:**

Drazinda Formation (Kirthar Group), near Drazinda town, District Dera Ismail Khan, Khyber Pakhtunkhwa, Pakistan; Middle to Upper Eocene (late Lutetian–Bartonian to Priabonian, ~43.5–38 Ma).

**Etymology:**

The species name refers to the locality (Drazinda) from which the fossil was collected.

**Age:**

Late Lutetian–Bartonian to Priabonian (Middle–Late Eocene), approximately 43.5–38 Ma, based on the established geochronology of the Drazinda Formation.

**Description:**

The shell (Figs. 2–5) is light brown, of medium size, planispiral and involute. Total shell diameter (D) is 10.0 cm and whorl width (WW) is 4.5 cm at the aperture (Fig. 3). Suture lines are visible externally and are slightly sinuous (Figs. 4, 5), marking successive chambers. Whorl height (WH) is 5.0 cm and whorl width at mid-flank is 3.5 cm (Fig. 2). A small inner whorl exposed on the ventral side measures 2.2 cm in length and 1.0 cm in width (Fig. 3).

**Morphometric parameters:**

WW/WH ratio = 3.5/5.0 = 0.70, indicating a compressed whorl section. WH/D ratio = 5.0/10.0 = 0.50, reflecting the involute coiling of the shell. Umbilical diameter (UD), measured against the centimetre scale of Fig. 4, is approximately 1.0 cm, giving an umbilical ratio (UD/D) of ~0.10; this narrow umbilicus is consistent with the diagnosis of *Eutrephoceras*. The septal foramina are not exposed on the available material and the exact position and ontogenetic migration of the siphuncle could not be determined without median sectioning, which was not undertaken so as to preserve the unique holotype intact.

**DISCUSSION:**

The Pakistani record of fossil nautiloids remains sparse. Prior to this study, only two genera had been documented from the country: *Bionautilus* from the Salt Range of Punjab and *Eutrephoceras* from K.P.K and Sindh (Jafri, 2024). Rohi et al. (2002) reported a further nautiloid from the Salt Range that resembles *Crinonautilus*. In western India, Halder (2012) erected two new taxa — *Deltoidonautilus vredenburgi* from the early Eocene Khari Nadi Formation and *Aturia gujaratensis* from the early Miocene Chhasra Formation. Taken together, these occurrences suggest that the Cenozoic nautiloids of the Indian Peninsula, of which Pakistan forms a part, were largely confined to a single basin within

ISSN-Print: 1025-2541
ISSN-Online: 3006-967X

the Tethyan realm. Nautiloid material from the Ranikot series of Sindh (Vredenburg, 1925, 1928) shows its closest affinity with assemblages described from Somalia (Haas & Miller, 1952; Sander, 1962).

Records from farther afield provide a broader comparative framework. Tongtherm et al. (2016) documented cephalopod fossils from peninsular Thailand, including the Ordovician nautiloids *Sacrothoceras banestanensis* and *Medignella maguma*, and Dastanpour et al. (2006) described an Ordovician orthoceratoid from east-central Iran. Haq et al. (1987) reconstructed the chronology of global sea level since the Triassic; in northern Pakistan the Tethys began to withdraw during the Paleocene (~55 Ma), reaching Sindh in the Pleistocene (~1.5 Ma). Juyal and Mathur (1994) recorded *Nautilus deluci* d'Archiac from the upper Subathu Formation of Himachal Pradesh, India. An Eocene cephalopod was recovered near Grdoselo in Istria, Croatia (Mikuž & Bartol, 2012), and Noda et al. (2001) reported Eocene nautilids from the Miyaragawa Formation of Ishigaki Island, Ryukyu, southwestern Japan. Saunders et al. (1996) clarified the status of *Nautilus praepompilius* Shimansky from the late Eocene of Kazakhstan.

Nautiloid records across the Cretaceous–Tertiary boundary were examined in Otago and the Chatham Islands, New Zealand (Stilwell & Grebneff, 1996). Tanabe and Chiba (1983) described a new *Deltoidonautilus* from the upper Eocene of western Kyushu, and Tsujino and Iwata (2009) reported *Aturoidea* from the Upper Cretaceous Sada Limestone of Shimanto City, Japan. Wani et al. (2008) announced the first fossil *Nautilus pompilius* from Pangasinan, northwestern Philippines. Ward et al. (2016) analysed the Paleocene cephalopod fauna of Pebble Point, Victoria, Australia, and unusual nautiloid occurrences are known from the upper Eocene La Meseta Formation of Seymour Island, Antarctica (Zinsmeister, 1978). Tertiary nautiloids of Patagonia were studied by Casadío et al. (1999), and Korn et al. (2020) analysed the morphospace of late Permian coiled nautiloids. LeBlanc (2019) has argued that fossil nautiloids of countries neighbouring Qatar — Egypt, Saudi Arabia, India and Pakistan — must be studied before the endemicity of the Qatari faunas can be properly assessed.

The occurrence of *Eutrephoceras drazindai* sp. nov. is best understood against the palaeoclimatic backdrop of the Middle Eocene Climatic Optimum (MECO, ~40 Ma). During this warming interval, the marine transgression across the eastern Tethyan shelf expanded warm, productive shallow seas over what is now the Sulaiman fold belt, conditions favourable to nautilid cephalopods and to the diverse foraminiferal, bivalve and echinoid assemblages of the Drazinda Formation. The confinement of *Eutrephoceras drazindai* to this shelf, alongside the Somalian and Qatari affinities noted above, is consistent with pronounced endemism among Tethyan nautiloid faunas of the Indian Peninsula. The present species, the only nautiloid so far described from the Drazinda Formation of northern Pakistan, indicates considerable remaining potential for cephalopod research in this region.

## CONCLUSION:

The documentation of *Eutrephoceras drazindai* sp. nov. from the Middle–Late Eocene (late Lutetian–Bartonian to Priabonian) Drazinda Formation of Khyber Pakhtunkhwa constitutes the first record of a new nautiloid species from northern Pakistan. Together with earlier reports from the Salt Range and Sindh, this finding widens the known distribution of Cenozoic nautiloids in the Indo-Pak sector of the Tethyan realm. The discovery supports the view that Cenozoic nautiloid faunas of the Indian Peninsula and adjoining regions were strongly endemic, with closest affinities to contemporaneous assemblages of Somalia, Qatar and other Tethyan margins, and it underscores the palaeobiogeographic importance

ISSN-Print: 1025-2541
ISSN-Online: 3006-967X

of Pakistan for understanding nautiloid evolution and dispersal during the early Cenozoic, particularly under the warm conditions of the MECO. Future work integrating stratigraphic, morphometric and regional comparative studies may reveal additional diversity and refine the reconstruction of Tethyan cephalopod palaeobiogeography.

**ACKNOWLEDGMENTS:**

I am thankful to my grandson Muhammad Qasim for composing the manuscript.

**LIST OF FIGURES:**



**REFERENCES:**

Casadío, S., Rodríguez, M. F., Reichler, V. A., & Camacho, H. H. (1999). Tertiary nautiloids from Patagonia, southern Argentina. *Ameghiniana, 36*(2), 189–202.

Dastanpour, M., Evans, D. H., & Bassett, M. G. (2006). A new orthoceratoid cephalopod from the Ordovician (Caradoc) of east-central Iran. *Geobios, 39*(3), 337–345. https://doi.org/10.1016/j.geobios.2004.11.008

Fatmi, S. F., Fariduddin, M., & Wnuk, C. (1995). *Paleocene–Eocene nautiloids from Lakhra, Sindh, Pakistan* (Technical Report). Geological Survey of Pakistan, Ministry of Petroleum and Natural Resources, 48 p.

Ghazi, H., Ali, S., Hanif, T., & Sharif, T. (2010). Larger benthic foraminiferal assemblage from early Eocene, Chorgali Formation, Salt Range, Pakistan. *Bulletin of the Geological Society of Punjab University, 45*, 83–91.

Gingerich, P. D., Russell, D. E., Sigogneau-Russell, D., Hartenberger, J. L., Shah, S. M., Hassan, M., Rose, K. D., & Ardrey, R. H. (1979). Reconnaissance survey and vertebrate paleontology of some Pliocene and Eocene formations of Pakistan. *Contributions from the Museum of Paleontology, University of Michigan, 25*, 105–116.

Haas, O., & Miller, A. K. (1952). Eocene nautiloids of British Somaliland. *Bulletin of the American Museum of Natural History, 99*(5), 317–354.

Halder, K. (2000). Diversity and biogeographic distribution of Jurassic nautiloids of Kutch, India, during the fragmentation of Gondwana. *Journal of African Earth Sciences, 31*(2), 175–185. https://doi.org/10.1016/S0899-5362(00)00082-8

Halder, K. (2012). Cenozoic fossil nautiloids (Cephalopoda) from Kutch, western India. *Palaeoworld, 21*(2), 116–130. https://doi.org/10.1016/j.palwor.2012.05.004

ISSN-Print: 1025-2541
ISSN-Online: 3006-967X

Haq, B. U., Hardenbol, J., & Vail, P. R. (1987). Chronology of fluctuating sea levels since the Triassic. *Science, 235*(4793), 1156–1167. https://doi.org/10.1126/science.235.4793.1156

Hemphil, W. R., & Kidwai, A. H. (1973). Stratigraphy of Bannu and Dera Ismail Khan areas, Pakistan. *U.S. Geological Survey Professional Paper, 716*, 36 p.

Humayun, M. (1990). *Structural interpretation of eastern Sulaiman foldbelt and foredeep, Pakistan* [M.Phil. thesis]. Oregon State University, 68 p.

Jafri, S. I. H. (2024). Diversity of invertebrate fossils in Pakistan. *Proceedings of Pakistan Congress of Zoology, 42*, 107–123.

Juyal, K. P., & Mathur, N. S. (1994). *Nautilus deluci* d'Archiac from the upper part of the Subathu Formation (Ilerdian–Early Lutetian), Himachal Pradesh, India. *Journal of the Palaeontological Society of India, 39*, 81–86.

Kazmi, A. H., & Rana, R. A. (1982). *Tectonic map of Pakistan, 1:2,000,000*. Geological Survey of Pakistan, Quetta.

Korn, D., Ghaderi, A., Ghanizadeh Tabrizi, N., & Gliwa, J. (2020). The morphospace of Late Permian coiled nautiloids. *Lethaia, 53*(2), 154–165. https://doi.org/10.1111/let.12348

Kummel, B. (1970). Ammonoids from the Kathwai Member, Mianwali Formation, Salt Range, West Pakistan. In B. Kummel & C. Teichert (Eds.), *Stratigraphic boundary problems: Permian and Triassic of West Pakistan* (pp. 177–192). University Press of Kansas.

LeBlanc, J. (2019). *Identification of the Middle Eocene nautiloid genera of Qatar, Middle-East* (Technical Report), pp. 56–72.

Malkani, M. S. (2014). Record of fauna and flora from Pakistan: Evolution of Indo-Pak peninsula. *2nd Symposium, International Geosciences Programme*, p. 19.

Mikuž, V., & Bartol, M. (2012). A new cephalopod find in the Eocene beds near Grdoselo in Istria, Croatia. *Geologija, 55*(2), 263–270. https://doi.org/10.5474/geologija.2012.016

Nielsen, S. N., Bandel, K., & Kröger, B. (2009). Palaeobiogeographical provenance, taphonomy, and mode of life of *Aturia cubaensis* (Cephalopoda, Nautiloidea) from Cenozoic deposits of Chile. *Geobios, 42*(1), 73–88. https://doi.org/10.1016/j.geobios.2008.07.006

Noda, T., Sugiyama, T., & Sasaki, R. (2001). First occurrence of Eocene nautilids from the Miyaragawa Formation in Ishigaki Island, Ryukyu Islands, southwestern Japan. *Bulletin of the National Museum of Nature and Science, Series C (Geology & Paleontology), 27*, 167–173.

Powell, C. M. (1979). A speculative tectonic history of Pakistan and surroundings: Some constraints from Indian Ocean. In A. Farah & K. E. DeJong (Eds.), *Geodynamics of Pakistan* (pp. 5–24). Geological Survey of Pakistan, Quetta.

Rohi, G., Baqri, S. R. H., Iqbal, N., Khan, F. R., & Fatmi, N. (2002). The discovery of an Eocene nautiloid from the Salt Range, Punjab, Pakistan. *Journal of Peshawar University Teachers Association, 9*(1), 51–56.

ISSN-Print: 1025-2541
ISSN-Online: 3006-967X

Sander, N. J. (1962). Aperçu paléontologique et stratigraphique du Paléogène en Arabie Saoudite orientale. *Revue de Micropaléontologie, 5*(1), 3–40.

Saunders, W. B., Shimansky, V. N., & Amitrov, O. V. (1996). Clarification of *Nautilus praepompilius* Shimansky from the late Eocene of Kazakhstan. *Journal of Paleontology, 70*(4), 609–611. https://doi.org/10.1017/S002233600002357X

Farouk, S., Ahmad, F. Y., & Smadi, A. A. (2013). Stratigraphy of the Middle Eocene–Lower Oligocene successions in northwestern and eastern Jordan. *Journal of Asian Earth Sciences, 73*, 396–408. https://doi.org/10.1016/j.jseaes.2013.05.005

Stilwell, J. D., & Grebneff, A. (1996). Records of Nautiloidea (Mollusca: Cephalopoda) across the Cretaceous–Tertiary boundary in Otago and Chatham Islands, New Zealand. *New Zealand Journal of Geology and Geophysics, 39*(1), 83–91. https://doi.org/10.1080/00288306.1996.9514696

Tanabe, K., & Chiba, N. (1983). A new species of *Deltoidonautilus* (Cephalopoda) from the Upper Eocene of western Kyushu. *Venus, 42*(3), 248–258.

Tongtherm, K., Nabhitabhata, J., Srisuk, P., Nutadhira, T., & Tonnayopas, D. (2016). New records of nautiloid and ammonoid cephalopod fossils in peninsular Thailand. *Swiss Journal of Palaeontology, 135*, 153–168. https://doi.org/10.1007/s13358-015-0108-8

Tozer, E. T. (1994). *Canadian Triassic ammonoid faunas* (Geological Survey of Canada Bulletin 467). Natural Resources Canada; Geological Survey of Canada.

Tsujino, Y., & Iwata, H. (2009). *Aturoidea* (Nautilida) from the Upper Cretaceous Sada Limestone in Shimanto City, Kochi Prefecture, Japan. *Cretaceous Research, 30*(4), 911–916. https://doi.org/10.1016/j.cretres.2009.02.003

Vredenburg, E. (1925). Description of Mollusca from the post-Eocene Tertiary formation of north-western India: Cephalopoda, Opisthobranchiata, Siphonostomata. *Memoirs of the Geological Survey of India, 50*(1), 1–350.

Vredenburg, E. (1928). A supplement to the Mollusca of the Ranikot Series. *Memoirs of the Geological Survey of India, Palaeontologia Indica, New Series, 10*(4), 1–75.

Wang, X. X., Zhang, J. J., Santosh, M., Yan, S. Y., & Guo, L. (2012). Andean-type orogeny in the Himalayas of South Tibet: Implications for early Paleozoic tectonics along the Indian margin of Gondwana. *Lithos, 154*, 248–262. https://doi.org/10.1016/j.lithos.2012.07.011

Wani, R., de Ocampo, R. S. P., Aguilar, Y. M., Zepeda, M. A., Kurihara, Y., Hagino, K., Hayashi, H., & Kase, T. (2008). First discovery of fossil *Nautilus pompilius* Linnaeus, 1758 (Nautilidae, Cephalopoda) from Pangasinan, northwestern Philippines. *Paleontological Research, 12*(1), 89–95. https://doi.org/10.2517/1342-8144(2008)12[89:FDOFNP]2.0.CO;2

Ward, P. D., Flannery, D. T. O., Flannery, E. N., & Flannery, T. F. F. (2016). The Paleocene cephalopod fauna from Pebble Point, Victoria (Australia) — fulcrum between two eras. *Memoirs of Museum Victoria, 74*, 391–402. https://doi.org/10.24199/j.mmv.2016.74.27

ISSN-Print: 1025-2541
ISSN-Online: 3006-967X

Zinsmeister, W. J. (1978). Eocene nautiloid fauna from the La Meseta Formation of Seymour Island, Antarctica. *Journal of Paleontology, 61*(4), 724–726.

## Figures:

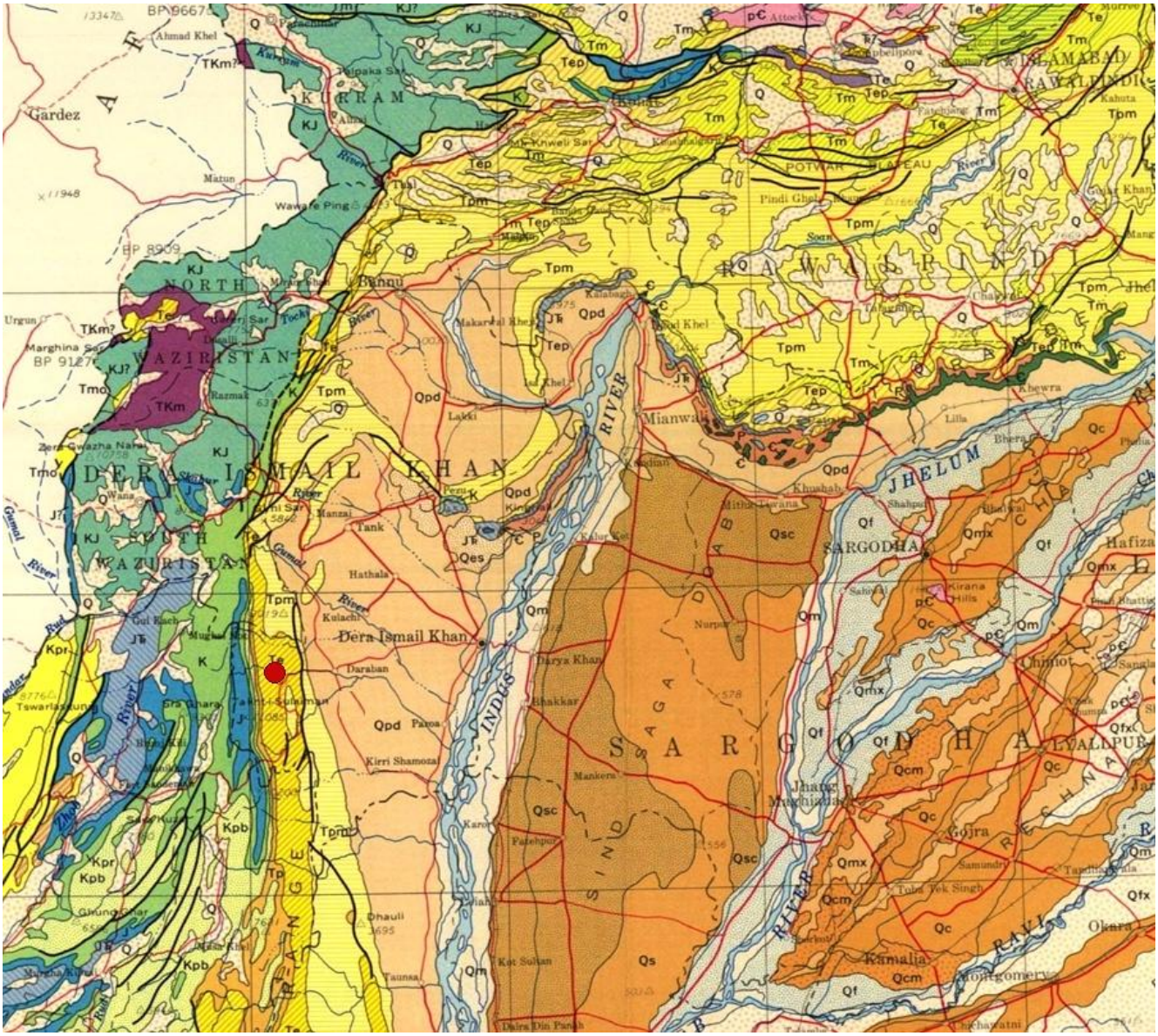


***Figure 1 Geological map of K.P.K showing the collection site (31°43'03"N, 70°08'42"E).***

ISSN-Print: 1025-2541
ISSN-Online: 3006-967X




Fig. 3 *Eutrephoceras drazindai* sp. nov., holotype — ventral view.

ISSN-Print: 1025-2541
ISSN-Online: 3006-967X

ISSN-Print: 1025-2541
ISSN-Online: 3006-967X

## Conflict of Interest:

"The author declares no conflict of interest."

## Funding for the Project:

"This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors."

---