Gondwana Research 19 (2011) 47–60

Contents lists available at ScienceDirect

Gondwana Research

journal homepage: www.elsevier.com/locate/gr

Paleo-environments and tectonic setting of the Mesozoic Thung Yai Group in Peninsular Thailand, with a new record of *Parvamussium donaiense* Mansuy, 1914

Wirote Saengsrichan [a,b,c,1], Thasinee Charoentitirat [b,c], Assanee Meesook [a], Ken-ichiro Hisada [d], Punya Charusiri [b,c,*]

[a] Department of Mineral Resources, Rama VI Road, Bangkok 10400, Thailand
[b] Department of Geology, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand
[c] Earthquake and Tectonic Geology Research Unit, Chulalongkorn University, Bangkok 10330, Thailand
[d] Division of Earth Evolution Sciences, Graduate School of Life and Environmental Science, University of Tsukuba, Tsukuba, Ibaraki 305-8571, Japan

ARTICLE INFO

Article history:
Received 23 August 2009
Accepted 17 May 2010
Available online 27 May 2010

Keywords:
Jurassic–Cretaceous
Paleo-environments
Tectonic setting
Krabi
Thung Yai Group
Peninsular Thailand
Parvamussium donaiense

ABSTRACT

The Thung Yai Group extends over a large area of peninsular Thailand, along the eastern margin of the Shan Thai block. Bound by angular unconformities 300 m thick dominantly detritic brackish to non-marine deposits with few intercalated limestone beds between Triassic marine and Tertiary non-marine sediments, represent the Thung Yai Group that comprises four formations: Khlong Min, Lam Thap, Sam Chom, and Phun Phin Formations. In the Ao Luk–Plai Phraya (ALPP) area, the Khlong Min and Lam Thap formations yield marine, brackish-water and non-marine fossil assemblages. These include trace fossils and for the first time in peninsular southern Thailand, the bivalve *Parvamussium donaiense* Mansuy, 1914. Based on fossil determinations, the Thung Yai Group has a late Early Jurassic to Early Cretaceous age.

Our new observations help unravel the tectonic history of Mesozoic Peninsular Thailand. After the complete closure of the Paleotethys in the Late Triassic, renewed inundation, from the late Early Jurassic to the early Middle Jurassic, brought a regime of shallow to open marine and lagoon sedimentation over northwestern, western and southern peninsular Thailand, in the eastern part of Sundaland bordering the Mesotethys to the west.

1. Introduction

Mainland Southeast Asia comprises three major terranes: Western Burma, Shan–Thai and Indochina (Burrett, 1974; Stauffer, 1974; Hutchison, 1975; Gatinsky et al., 1978; Bunopas, 1981; Burrett et al., 1990; Barber and Crow, 2003; Metcalfe, 2006, 2010). Thailand consists in the west of the eastern part of the Shan–Thai terrane and in the east of the western part of the Indochina terrane. The intervening tectonic units (Fig. 1) are the Lampang–Chiang Rai unit, for the eastern part of Shan–Thai, and the Nakhon Thai unit, for the western part of Indochina (Charusiri et al., 2002, 2006; Hara et al., 2009). Our study area belongs to the southern part of eastern Shan–Thai terrane, west of the Pattani suture (Charusiri et al., 2002), which is considered to connect southward with the Bentong–Raub suture, in Malaysia. The latter suture resulted from the collision of the Indochina and Shan–Thai terranes (Bunopas, 1981; Hahn et al., 1986; Panjasawatwong, 1991) mostly during Late Triassic times (Metcalfe, 1989; Charusiri et al., 2002; Meesook et al., 2005) (Fig. 2). Our focus of interest here relates to extensive on-shore petroleum exploration.

The present study area is part of the Ao Luk and Plai Phraya districts (ALPP) that cover approximately 400 km^2 within the Songkhla basin in the northern part of the Krabi Province, southern peninsular Thailand (Fig. 1). Geomorphologically an intramontane sub-basin, the area of the ALPP is bound to the east by the Phanom Benja Range culminating at 1340 m above mean sea level (msl) and west of it, the undulating terrains of the northwest–southeast trending, about 500 m high Phanom Hills extend.

The Mesozoic sequences in Thailand comprise marine, brackish and continental facies (Meesook and Grant-Mackie, 1996). Exclusively marine in western Thailand, the most fully developed Jurassic sediments occur in the Mae Hong Son–Kanchanaburi basin of northwest and west Thailand. In peninsular Thailand, the Chumphon basin to the north and the Songkhla basin, further south contain Jurassic marine sediments. With exception of the continental basins in northeastern Thailand, most marine and brackish Jurassic basins are elongated north trending, normal fault or strike-slip bound (Fig. 1). In the Songkhla basin, the Ao Luk–Plai Phraya (ALPP) area comprises the Thung Yai Group that encompasses four formations: Khlong Min, Lam Thap, Sam Chom, and Phun Phin Formations. The Khlong Min and Lam Thap Formations yield

* Corresponding author. Department of Geology, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand. Fax: +66 22185464.
E-mail address: cpunya@chula.ac.th (P. Charusiri).
[1] Deceased.

1342-937X/$ – see front matter
doi:10.1016/j.gr.2010.05.006

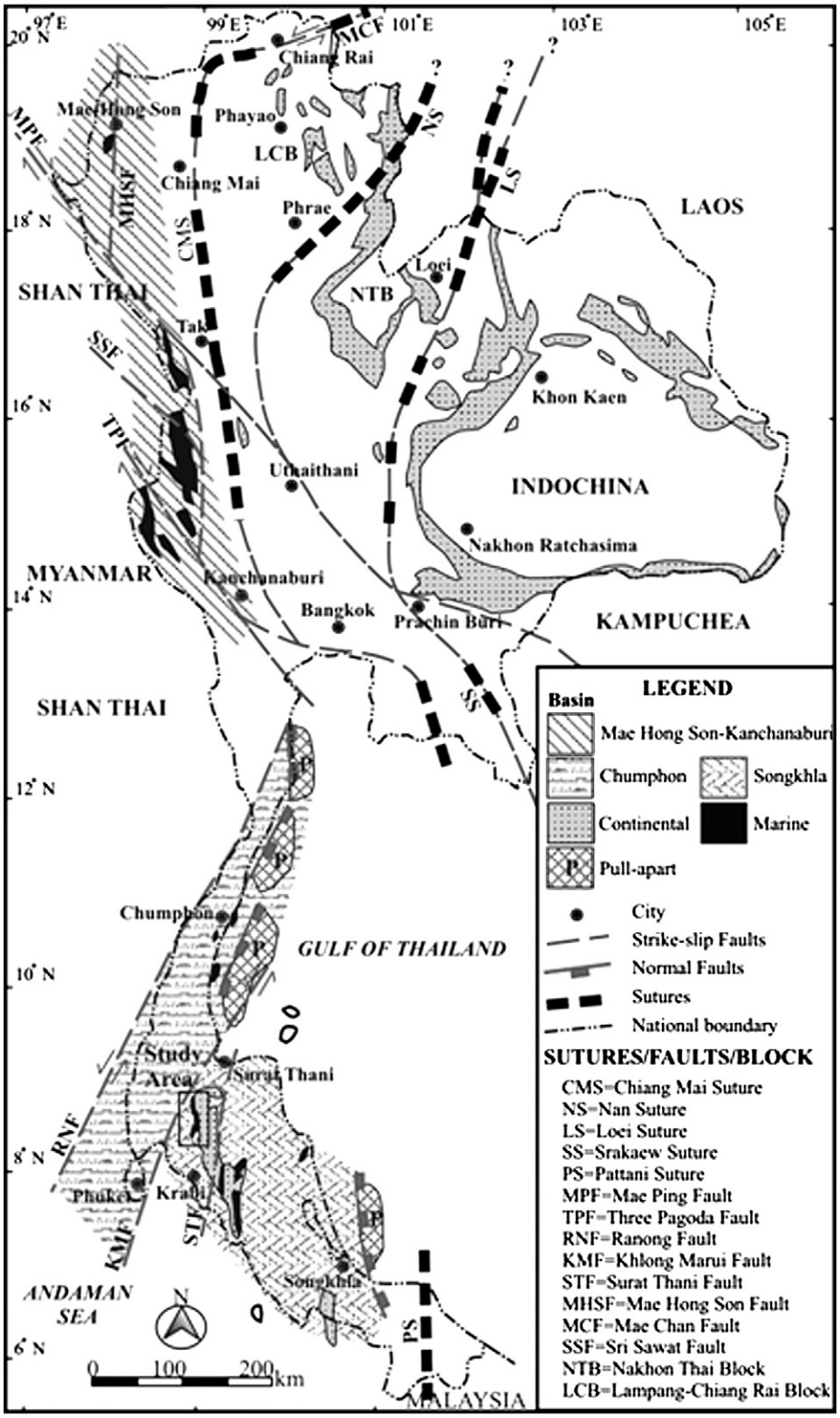

Fig. 1. Map of Thailand showing major tectonic units, distribution of the Jurassic–Cretaceous sedimentary rocks, associated basins, and major tectonic features (modified after Polachan and Sattayarak, 1989; Charusiri et al., 2002).

bivalves and some other macrofossils that provide age constraints for stratigraphic correlation and the establishment of the continuity of lithologic units. Their relations with the better-known non-marine Khorat Group to the east are also considered.

Besides the first discovery of the Jurassic bivalve *Parvamussium donaiense* Mansuy, 1914 in the Songkhla basin, other Mesozoic bivalves occur. Brackish-water heterodont bivalves among them show ecological and taxonomical diversifications (Kondo et al., 2006). These play an important role in the evaluation of their paleo-environment and the delineation of their paleo-biogeography (Arias, 2008). All fossils cited in the text are part of collections during fieldwork by the authors, unless otherwise indicated.