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CHAPTER 1

A Note on the Paleo-Ethnoherpetology of Giant Softshell Turtles (*Trionychidae*) in Kra-Dai and Austronesian

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[ABSTRACT]

Among the many and varied herpetofauna of China and Southeast Asia, two softshell turtles *Refetus swinhoei* and *Pelochelys cantorii*, stand out due to their enormous size. These turtles are linguistically differentiated from smaller species of the *Trionychidae* family in Chinese (*yuan* vs. *bie*) as well as in some Kra-Dai languages (*top* vs. *faa*). Cognates for *top* are limited to Central Southwestern Tai of northern Vietnam and Houa Phan (Laos), Hlai on Hainan, and are found in Austronesian languages of northern Luzon and Taiwan. A Sino-Vietnamese lexeme *giải* ~ *giài* likely derives from Chinese *xī* ~ *xí* MC *xhɣjaj or *ɣwɛj meaning 'sea turtle' (Pulleyblank), and is not an indigenous Austroasiatic taxon. The distribution of linguistic forms for large softshell turtles is compared with that of the turtles themselves, and based on this examines pre- and proto- historical relationships inferred from that distribution, especially with respect to Kra-Dai and Austronesian linguistic stocks.

1. Introduction

This paper compares distribution of linguistic etyma for large softshell turtles of the family *Trionychidae* with that of the turtles themselves, and based on this examines pre- and proto- historical relationships inferred from that distribution, especially with respect to Kra-Dai and Austronesian linguistic stocks.

Turtles are reptiles belonging to the order *Testudines*. They are divided into two suborders, *Pleurodira* (side-necked turtles) and *Cryptodira* (turtles that retract the head into the shell). In our area of focus of East and Southeast Asia, most turtles are Cryptodirids belonging to three families, *Geomydidae* (Asian pond, leaf, and box turtles), *Platysternidae* (the big-headed turtle, monotypic family and genus) and *Trionychidae* (softshell turtles). Sea turtles, super-family *Chelonioidea* belong to the *Cryptodira* as well.

Giant Softshell turtles, namely Cantor's Giant Softshell (*Pelochelys cantorii*) and Swinhoe's Giant Softshell or the Yangtze Giant Softshell (*Refetus swinhoei*), overlap in range. Both occur in the basins of the Red River, the lower Yangtze and originally the territory between these two rivers, with *Pelochelys* ranging further southwest and east into insular Southeast Asia. The sympatric nature of the range has not been studied and because both species have been largely extirpated from their original homes, whatever ecological niche partitioning may have been in place remains obscure.

One other giant softshell needs to be mentioned, though it is found in areas only peripheral to the focal area of the present study. That is the Asian Narrow-headed Softshell, genus *Chitra*. Its range is restricted to Thailand and parts of Burma, Malaysia and Java. It is known to attain a length of 123 cm and weights of over 200 kg. Its Thai name is *ban C3 laai A4* or *maan B4 laay A4* ม่านลาย DL4 *maan B4 laay A4* ตะพานม่านลาย. In Thailand it is rare having been hunted by fishermen and subject to habitat destruction, especially by hydropower projects (Kitimasak 2005). Nutphand (1979) gives also *kriw* กริว or *kraaw* กราว for this softshell. Thai dictionaries also have จริว, ตริว meaning ‘softshell turtle,’ glossed as *taphaap* ตะพาน for both terms. Possibly they are old Khmer or Mon borrowings. Also *kriw A2 laay A4* กริวลาย, *moom B4 laay A4* ม่อมลาย, *kraaw A2 daan B3* กราวค้าง are cited by Nutphand. In the Royal Institute Dictionary of 2554 (2011) examples the kindom level (UB) taxeme *tua A2* is used before *kraaw*, whereas *kriw A2* seems to stand alone.

Softshell turtles are under-lexicalized in the various sources on Southeast Asian languages. Often they are glossed with such epithets as ‘water tortoise,’ ‘freshwater tortoise,’ or simply ‘tortoise,’ and so on, leading to problems in identifying the true referents in cognate sets. In herpetological parlance nowadays, usage recommended by the American Society of Ichthyologists and Herpetologists, a ‘tortoise,’ is a hard-shelled land-dwelling member of the family *Testudinidae*, and ‘turtle’ refers to hard-shelled aquatic or semiaquatic species, or, to turtles as a whole. However, in the 19th century Swinhoe himself along with others such as Gray who first described the holotype for *Rafetus*, referred to softshell turtles as “mud-tortoises” (Bettelheim 2012). Softshell turtles, all belong to the family *Trionychidae*, are completely aquatic, and are distinctive because of the soft or leathery texture of their carapaces, and because of their long pointed noses. They also possess a specialized pharyngeal adaptation that allows them to absorb oxygen from the water without having to surface for long periods of time. They are not easily confused with hard-shelled turtles and tortoises. The gloss ‘water tortoise’ is (nowadays) consequently a non-sequitur.

In previous writings (eg 1977, 1981, 2016) the author has presented evidence based upon indigenous histories and Tai zootaxonomies that place the Tais, Ou Yue and Luo Yue, in the lower Yangtze basin. Essentially, animals with the most extensive north-south ranges have taxa reconstructable in Proto-Tai, whereas animals found only south of the Tropic of Cancer do not. For example, the Chinese Softshell Turtle *Pelodiscus sinensis* which ranges widely across China and Southeast Asia has consistent cognates in Kam-Tai languages and even in Hlai where it is applied to sea turtles (Chamberlain 1981). The term is also usually applied to *Palea steindachneri*, the wattle-necked softshell turtle which occurs in most of southern China and northern Indochina, including Hainan, and to other species. The name for all of these species can be traced back to Proto-Austronesian.

PAN

*qaCipa (Blust)

*qatipa (Wolff)

Proto-Kra-Dai

*Cipa: (Ostapirat)

Proto Kra	*pa: (Ostapirat)
Lachi	-pu: A1
Proto-Kam-Tai	*k-p-
Then (T'en)	(ne ¹³ kau ³⁵ fjaa ³⁵ (F-k. Li) ¹
Sui (Tingpai)	(fi ⁷) fia ¹ (Ostapirat p.c.)
Proto-Tai	*β^oya: (Ostapirat p.c.)
Be	bi [?] (Hashimoto) ²
Sek	via
SW	faa
C	faa
N	fua ~ fuuu (Dioi: voueu)
Liujiang	hwɿ A1 (Pittayaporn 2009)
Hlai (Bai-sha)	faa ³³ (A) 'sea turtle' (Wang and Qian 1951)

Some other forms for 'softshell'

Southern Dong	pjin ³²³ 'tortoise' (Long and Zheng 1998)
Kam	pjin ³²³ 'Softshell turtle' (Mahidol 2000)
Sui	mom ⁶ tjaau ⁵ [fish+turtle] (Mahidol 2003)
	taam ⁴ 'Softshell turtle' (Mahidol 2003)
Pu Peo (Laqua)	pa tāw ¹ [fish+turtle];
	kapông ² 'softshell turtle' (Hoàng et al.)

One Pubiao form shares a compound with geographically distant Sui, and shows another unrelated etymon with no cognates noted elsewhere. Red Gelao vu³⁴ (kuxi^{25?}) 'Chinese softshell' (Mazo 2011) is a Chinese borrowing, the first syllable of which is of unknown provenance. A similar form is found in Northern Dong wu³³ kiu³³ glossed simply as 'tortoise' (see below).

The 'fish' + 'turtle' construction (as in Sui and Pu Peo above) or the 'fish' + 'softshell' one (as in Lao *paa faa*) that occurs sporadically in Kra-Dai languages can be interpreted as another example of anomalous or equivocal classification in folk biological taxonomies. The classic example is Bulmer's "Why is the cassowary not a bird?" Another example in many Tai languages is 'python' not classed as a snake. In this paper we observe softshells (*faa A1*) not classed as turtles (e.g. BT *too faa*) and even one step further, large softshells not classed as softshells.

¹ Weera Ostpirat p.c. notes that this Then reflex for PKT *k-p- should be either xw- or v-as in xwen or vun 'rain'. Li (1968) adds that the kau³⁵ element means 'owl', no doubt referring to the owl-like face of softshells.

² Ostapirat (p.c.) points out that the Be form /bi[?]/ is probably unrelated to the others cited here. Be's final -[?] usually goes back to *-c and initial b- < *p-, thus bi[?] < *pic or *pi:c. This might fit better under 鱉, 鼈 biē MC pjiet (p- + -jiet D) OC *pet 'softshell turtle' (Baxter-Sagart). Biao has *pit* as well.

The reconstruction of the Proto-Tai form for ‘softshell’ is not without its difficulties. For Proto-Tai Pittayaporn (2009) reconstructs **^hwuə* based on NT Liujiang, while Li (1977) has **faa* A. If compared to ‘cloud’ (C tone) for support as it usually is, there are problems because Lao has /fua C/ ‘cloud’ and /faa A/ ‘softshell’, demonstrating the Tai tendency to diphthongize long /aa/ sporadically (note also Siamese /faaŋ/ ~ Lao /fuaŋ/ ‘straw, stubble’). This seems to be the case with the NT branch with its /-uə/ and /-uuu/ reflexes. Ostapirat (2013) resolves the PT vowel reconstruction problem by introducing a velarization feature hence **β^haa* also accounting for the initial /v-/ of Saek.

With respect to the coastal origins of the Tai (Yue), a number of lexical items specific to the coast support the notion that these areas were peopled originally by Be-Tais. Such lexical items are not found in Kam-Sui languages suggesting that Kam-Sui did not have a coastal association. One such conspicuous form is the word for ‘salt-water crocodile’ (*Crocodylus porosus*) usually glossed as ‘mythical water creature,’ where the etymon occurs in Tai languages that are no longer found along the coast. The size and imposing nature of this reptile, which may grow to a length of eight meters, must have left a lasting impression on the minds of the seafaring Yue, to a degree where the taxon has survived not only in Tai languages but as part of the Tai substrata in Chinese as well:

Proto-Tai **ŋaak* > ŋuək , ŋuuuk , ŋɣɣk , ŋuak

OC **ŋāk*

LH **ŋak* (Schuessler) ‘salt water crocodile’ < Cantonese: ŋok , Amoy: go’k

Significantly, the etymon does not occur in Hlai, although in former times this crocodile was found along the shores of Hainan as well as nearby along the coasts of Guangxi, Fujian, Guangdong, and Vietnam. Hlai appears to have another taxon, PH **kəy?* (Norquest), with the C tone seemingly cognate either with CSWT *khee* ~ *kēe* ~ *khia* ~ *hia* ‘crocodile (freshwater)’ or *hia* ~ *hee* ~ *kia* ~ *chia* ~ *chii* ‘water monitor (*Varanus salvator*)’ all of which take the (Tai) C tone (Chamberlain 1977). But semantic confusion between the two is likely. Water monitors (PSWT **hia* C1) are common on Hainan, whereas the crocodiles have long been extirpated. Perhaps all of these forms relate ultimately to the OC terms for the ‘giant salamander’ (*Andrias davidianus*), once found from the Yellow River south to the Middle Yangtze, and far beyond. The water monitor is found only south of the Tropic.

It would be reassuring to have both taxa in Hlai, crocodile and *salvator*, for comparison to ensure that the two animals have indeed been distinguished correctly in the data, but so far the forms have not been co-elicited.

That the ‘crocodile’ taxon does not occur in Hlai is important as it indicates Hlai and Tai were separate prior to their arrival on the coast. After separating from Proto-Kra-Dai in Chǔ, the Rei/Li (> Hlai) probably traveled to the coast by inland routes (Chamberlain 2016). Along the northern portion of its former range, in Chinese languages spoken there, in Fujian (Min) and Guangdong, the etymon for *porosus* agrees with the Tai languages, but is conspicuously lacking elsewhere. It does not occur in Kam-Sui. (We do not know if it occurs in Ong Be.) Had Kra-Dai originated on the southeast China coast this should not be the case. The Hlai form’s

derivation from the OC word for ‘giant salamander,’ an inland non-coastal and more northerly animal, would support this conclusion.

2. Softshells in Southeast Asia and Southern China

In another example, the one that concerns us here, a word for the giant softshell turtles (*Pelochelys cantorii* and *Rafetus swinhoei*), PCSWT ***top** is found in the Central Southwestern Tai languages (where it is used specifically for giant softshells as distinct from ***faa**, and is preserved in Hlai on Hainan, glossed as ‘turtle’, or ‘point-nose turtle,’ and in several languages from the northern Philippines as simply ‘turtle.’ No doubt the lack of specificity of the glosses is due to data collection. In fact, the distribution of the taxon mirrors that of the species which is found in Hainan and in the northern Philippines, as well as along the Red, Black, and Clear Rivers, Mā and Chu (Xam) and the southern Chinese coast. Giant softshells are not, however, found on Taiwan, even though cognates occur in Austronesian languages there, glossed either as ‘softshell,’ or ‘river tortoise,’ so either it may have lived there in former times (for which there is no evidence), or the taxon was introduced from the Philippines. Interestingly, the *Pelochelys* form PCSWT ***top** does not occur in Northern Zhuang or Pu Yi, although in 2007 a female *Rafetus* was discovered in the Changsha zoo in Hunan, not too far away (Bettelheim 2012). Both species, are the largest of the softshell turtles, *Pelochelys* reaching a length of almost 200 cm, so it is not easily ignored. They live (or lived, as they are almost extinct) in large inland rivers such as the Red and the Black, in lakes, and in brackish water along the coast, even sometimes found at sea

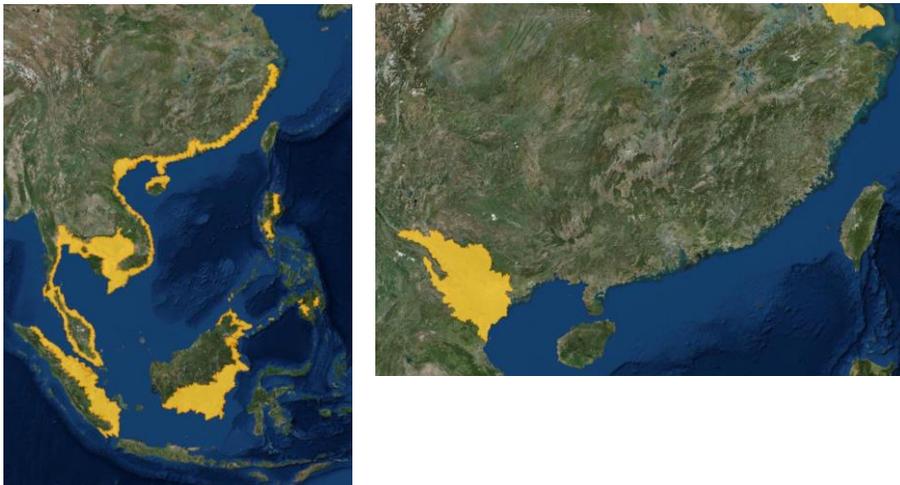


Figure 1 Ranges of *Pelochelys* (left) and *Rafetus* (right) Source: IUCN Red List

Bettelheim (2012) reports at least four specimens of *Rafetus* originating from the Mā River in Thanh Hóa, and another possibly from Nghệ An.

In Chinese both species are called *yuán* 鼈.

The two giant softshell turtles had a sympatric distribution. *Pelochelys cantorii*, Cantor's giant softshell turtle, the Asian giant softshell turtle, or the frog-faced softshell, is still extant but rare. *Refetus swinhoei* the Yangtze giant soft-shell, also known as the Red River giant softshell turtle, the Shanghai softshell turtle, the speckled softshell turtle, and Swinhoe's softshell turtle, is functionally extinct.

In addition to the two giant softshell species, several other members of the family *Trionychidae* inhabit our area of focus.

Amyda cartilaginea, the Asiatic Softshell Turtle is found throughout Southeast Asia, Bangladesh, and parts of India. Although not listed for China, in August of 2017 a very large *cartilaginea* was discovered when dredging a temple pond in Fujian Province. Its carapace measured one meter by 60 cm, and it weighed over 50 kilograms. When first encountered it was mistaken for *Rafetus* because of its size.



Figure 2 *Amyda Cartilaginea* in Changtian Temple, Quanzhou, Fujian Province

Source:<http://chinaplus.cri.cn/photo/china/18/20170808/14718.htm>

Palea steindachneri, the wattle-necked softshell, has a northern range and is found in Southeastern China (Guangxi, Guangdong, Guizhou, Yunnan, Hainan), northern Laos and northern Vietnam. It is smaller reaching a maximum length of 43 cm, and inhabiting forested streams, often at high altitudes. It is the most esteemed of all the softshells for eating, according to the Black Tai (Chamberlain 1981) and on Hainan (Pope 1935: 64). It seems to be the softshell recorded by Savina as *tu lang* 'petite tortue d'eau douce; reptile chelonian fam. de Trionychides (Viet. con dam-dam).' In Guangxi, at least, in Chinese it is called 'mountain jade' shanrui 山瑞 (Meng Yuanyao and David Holm p.c.).

Pelodiscus sinensis, the Chinese Softshell Turtle, is found throughout China and Taiwan, and ranges into Japan, Korea, and parts of Russia. It also occurs in Vietnam, Laos and Thailand. In some areas it has probably been introduced. In Chinese it is known as *bie* 鳖 (also called 'sand turtle' *shabie* 沙鳖, or in more popular parlance 'carapace fish' *jiayu* 甲鱼, 'water fish' *shuiyu* 水鱼, or *wangba* 王八). The phenomenon wherein softshells are classified as fish is also found in Lao

and in Nyuan of Northern Thailand. (*ibid*)

One additional species called the Lesser Chinese Softshell, *Pelodiscus parviformis*, inhabits Guangxi, Hunan, Hainan, and Zhejiang. The examples from Hainan and Vietnam are now considered as a separate species *Pelodiscus variegatus*, the Spotted Softshell. (Fritz et al. 2019; Yang et al. 2011)

3. The Yangtze Giant Softshell – *Rafetus swinhoei*

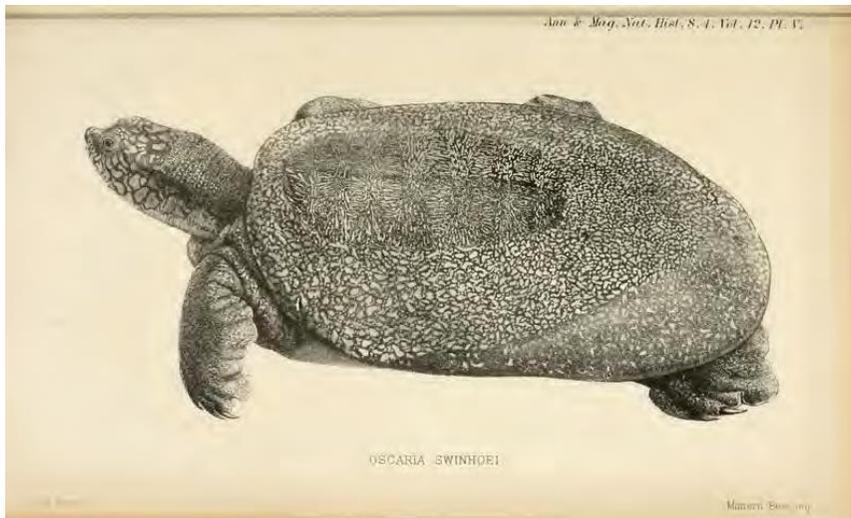


Figure 3 Drawing by John Edward Gray of the British Museum in 1873 who described the holotype specimen sent to him by Robert Swinhoe (Bettelheim 2012: 9)

Although this softshell was originally identified as occurring in both the Yangtze and in lakes around Hanoi, an attempt was made to claim the Vietnamese specimens represented a separate species, *Rafetus leloii*, after the 15th century king Lê Lợi, and later changed to *vietnamensis*. The claims were not accepted by herpetologists, as local experts did not submit the genetic code to GenBank (the open access international database of nucleotide sequences) as would have been appropriate had the claim been legitimate. Furthermore, the International Code of Zoological Nomenclature (ICZN) was violated when the name was changed unilaterally from *leloii* to *vietnamensis*. *Leloii* itself was never accepted although it was submitted twice, once in 2003 and again in 2010, the genetic evidence having been rejected. Most recently however, genetic evidence has demonstrated conclusively that the turtles in China and in Vietnam are the same identical species. (Lê et al. 2014)



Figure 4 *Refetus swinhoei* at the Suzhou Zoo in China

(Source:

https://www.google.la/search?q=yangtze+giant+softshell&sxsrf=ALeKk01sSVPZcD80zw6hGe19pCIsU1byOq:1599273616532&source=lnms&tbm=isch&sa=X&ved=2ahUKewi-mb--tDrAhWf4HMBHQPZD-wQ_AUoAXoECB4QAw&biw=1861&bih=1196#imgrc=o2lqjVpFdDymIM&imgdii=aG1-pXc70FtDM) [Last Access: Nov. 25th, 2020]

Despite the notoriety of this turtle in Vietnam, there is no monosemic indigenous Austroasiatic taxon for the animal, either in Vietnamese or in Muong. The surviving giant softshells are considered so unusual that they have been given individual names or titles, rather than generic ones. This would seem to indicate strongly that the Vietnamese were not familiar with either species which would certainly not have been the case if early Vietnamese or Vietic peoples had occupied the Red River Basin.

Only two terms are on record as employed by fishermen in rural areas, but they lack easily verifiable etymologies (Bettelheim 2012; ATP news³):

“Con Giai” was recorded in Hòa Bình and also in Quảng Ninh and Bắc Giang.

“Conh Chanh [sic]” also in Hòa Bình.

Neither of the terms relates to taxa in other Kri-Mol languages. As mentioned above, “Con Giai” is most probably a coastal Chinese word for ‘sea turtle’ borrowed into Vietnamese at a later date.

³ <https://www.facebook.com/AsianTurtleProgram/posts/1170204619680044/> [Last Access: Nov. 25th, 2020]

The only etymon that exists consistently is Tai (***top**) and Hlai (***ʔt̪i:p, *thw:p**), with cognates in Austronesian. Chinese uses *yuán* or *yuán yu* for the large softshells of the Yangtze.

That the original distribution was much wider is demonstrated by the bronze representation of a *Rafetus* dating from the Shang Dynasty and found north of the Yangtze in Henan (see below). Behr (2019) notes that, “its presence in the Yellow and Huan Rivers is well-attested in Early Middle Chinese sources, up to a last mentioning in the 11th century CE.”

4. The Asian Giant Softshell – *Pelochelys cantorii*

The range of *Pelochelys cantorii* is the most widespread as can be seen on the map. Currently a stretch of the Mekong in Cambodia has the highest population due to conservation efforts, but it has largely disappeared from most of its former range. It has been reported from Laos and Thailand as well as Vietnam. Of interest for this paper, is the occurrence of the turtle in the basins of the Red (*Nam Tao*), the Black (*Nam Tè*), the Clear (*Sông Lô*), the Mã, and the Xam (*Sông Chu*) Rivers in northern Vietnam and Laos, as well as on Hainan island, and in northern Luzon, especially in the Cagayan River Basin (Brown et al. 2013), which corresponds with the distribution of linguistic terms that correspond only in these locations. These can be seen in the data below.



Figure 5 *Pelochelys cantorii* from Cambodia (left) and Sumatra (right)
(Sources: Wiki commons; <http://rejang-lebong.blogspot.com/2009/06/pelochelys-cantorii-sp-from-rejang-land.html>
[Last Access: Nov. 25th, 2020])

The Vietnam turtle book (Hendrie et al. 2010) indicates it is found in most all of the coastal provinces (see Figure 6) and in the Mekong and Red River deltas, though no details are provided. Its name is given as *giài*, the same as for *Rafetus*.



Figure 6 Range of *P. cantorii* in Vietnam
(Source: Hendrie et al. 2010)

In Guangxi, Professor Meng Yuanyao from the Guangxi University of Nationalities reports (email to David Holm 6 August 2019):

The *yuan* 鼈, also called the scabby-headed *yuan* (癞头鼈 *laitou yuan*) [*Pelochelys cantorii*], is a larger animal, and often grows to around 10-20 pounds in size. The largest specimens are around 200 pounds. The head of this species is not as pointed as that of the *bie* [Chinese Softshell] or mountain jade [*Palea Steindachneri*], but rather like that of a green frog, and rather blunt. The back of the head is a yellowish-brown color or greenish-brown. The belly is yellowish-green.

This species is reported also to be raised on farms in Guangxi, but not in great numbers like the smaller species of *Palea* and *Pelodiscus*. The term *yuan* 鼈 is therefore used for both species of giant softshells (David Holm *ibid*).

5. The Giant Salamander *Andrias davidianus*

As has already been mentioned, one unusually large, aquatic and somewhat mysterious creature whose name may have been applied to giant softshells and to water monitors and crocodylians, is the Chinese giant salamander *Andrias davidianus* of the family Cryptobranchidae. Its habitat consists of fast flowing streams at higher elevations between 200-1,100 meters with mean annual temperatures between 12.7 – 16.8 degrees Celsius, and dense vegetation (Chen et al. 2018). The streams for which records exist are mountain tributaries of the Yellow, the Yangtze and the Pearl (*ibid*).⁴

⁴ Recent research has determined that the giant salamanders in China belong to at least three species, originally separated by river basins the Yellow, the Yangtze, and the Pearl. The southern species is now named *Andrias sligoi* and is the largest. Because of widespread

Liu (1950: 69-70) writes that the common Chinese name is “nei-yu,” and that the Shan-hai-ching ("Documents of the sea and mountains") written in 600 BCE describes it as follows:

In the streams of Ille-tzu [*sic*], Shansi Province, there are found numerous Nei-yu; their form is similar to that of a serpent; the largest one is called Sha-yu.

Later in the Han Dynasty, second century BCE Sima Qian noted that this salamander was found in Shensi Province where it was named *Jen-yu* ‘man-fish.’ The Erh-Ya of Koo Po (c. 300 CE) wrote that the *nei-yu* made cries similar to those of a small infant, and also that the larger ones, 8-9 feet long, were called *Sha-yu*. (Liu *ibid*).

Schafer (1967: 293) cites the Middle Chinese word for (giant?) salamander *t’ap 鰻 found in the 11th century rime dictionary Guangyun of Lu Fa-yen. This is discussed below.

Giant salamanders may attain a length of two meters, can vocalize with hisses, and barks and are able to whine in a way that sounds like a baby crying. They are one of only three extant species of cryptobranchids, amphibians that separated from other salamanders in the Jurassic period. The Japanese giant salamander and the North American hellbender are the only other living members of the family.

Sadly, the giant salamander has become a luxury food in China leading to the almost total extirpation of the species from the wild, and it now survives mainly in farms despite conservation efforts. Historically its edibility was apparently limited mainly to the Cantonese according to Liu (1950), and there seem to be no historical records of the practice elsewhere.



Figure 7 Giant Salamander from Guangxi Province and Habitat
(Source: <http://www.aquapress-bleher.com/giant-salamander-in-guangxi-province> [Last Access: Nov. 25th, 2020])

farming most of the surviving salamanders are nowadays hybrids, and only a few remain in the wild. (Turvey et al. 2019).

The original range can be roughly deduced from county gazetteer records collected by Fei et al. (2006) as shown in Figure 8. At one time it must have inhabited large areas of Central China, particularly in the provinces of Hunan, Guizhou, Shaanxi, Hunan, Hubei, and Zhejiang.

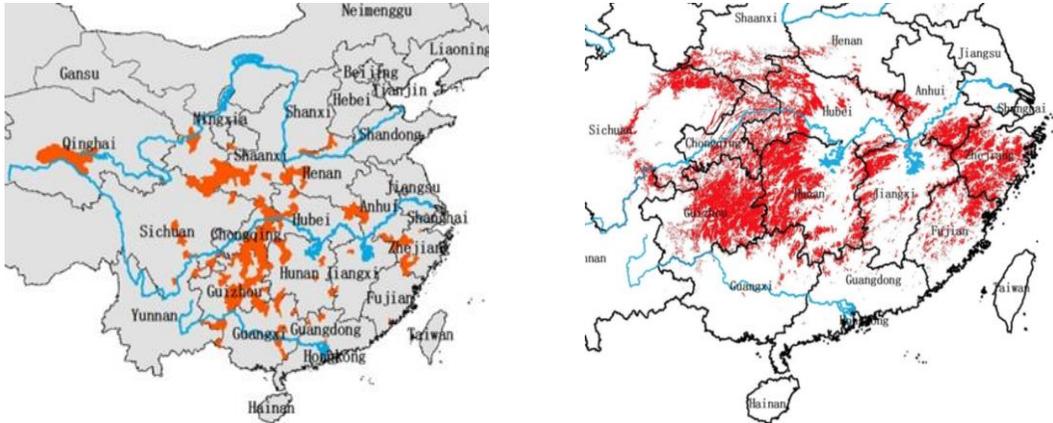


Figure 8 Gazetteer records of the Giant Salamander (left) and presumed original range based on calculated suitable habitat (Source Fei et al. (2006) and Chen et al. (2018))

An analysis of suitable habitat, which may serve as a proxy for its distribution in earlier times, was carried out by Chen et al. (2018) based on the county records combined with community-based interviewing. This area is shown on the second map in Figure 8.

The only Chinese form most relatable to CSW Tai ***top** and Hlai ***ʔti:p** is MC ***t'ap** 鰲 which in one source cited above has the meaning ‘giant salamander’ but also another, perhaps more recent, meaning referring to ‘sole, plaice’, large flat bottom-dwelling salt water fish shaped like softshells. Although it is tempting to assume that this, or an earlier form was the source of the Tai and Hlai words, there is no evidence to support this. Rather, it would appear as if Chinese borrowed the term from Hlai (that is Li on the mainland) sometime after Proto Kra-Dai unaspirated stops became aspirated. CSW Tai, on the other hand, would have received the unaspirated form from Hlai at an earlier period, prior to this sound change.

Otherwise there is no real data of evidential value in current Kra-Dai lexicons.

Northern Zuang

Meng Yuanyao

ʔak⁷ ʔe⁴ yam⁴

Giant Salamander

大鰲

A. davidianus

(Lit. ‘water gecko’)

Sui	Mahidol	mom ⁶ tin ² ma ¹ (‘dog foot fish’)	Giant salamander <i>Andrias davidianus</i>
		mom ⁶ va ⁴ va ⁴ vi ⁴	<i>Andrias davidianus</i> < 娃娃魚 (wáwáyú)

These represent the total known forms from Kra-Dai to date.

6. Chelonian Mythology in Vietnam and China

To the Black Tai of northwestern Vietnam, turtles are auspicious animals. The carapace of a /taw B2/ ‘hard-shelled turtle’ was placed on the /saw A1 hɛək DL4/ or main pylon of a new house so that the turtle will always be present. Indeed the rounded roof of the house itself is compared by the Black Tai people to the shape of a carapace. Turtle jaw bones are also placed on the /laa A1 sia A4/ or cloth child-carrying strap to keep evil spirits away from children. In principle turtles should not be eaten and there is the expression *taw-faa-maa-lij* ‘turtle-softshell-dog-monkey’ referring to animals that should not be eaten, but for which taboos are often broken, or adhered to only by old people.

A Black Tai myth relates that the chief /thɛən A1/ ‘heavenly spirit’ in ancient times when all the animals could talk, decided to test their loyalty by feigning death to determine which of them would mourn his passing. It so happened that only the human and the tortoise climbed up the rocky mountain to see him. The tortoise was having difficulty so the human picked him up and carried him in his armpit. When they arrived, the *thɛən* saw that only the human and the tortoise really loved him. He declared that the human and the tortoise were equal, but that all other animals could be eaten. Another version of the myth is found in Roux (1954: 362ff).

In the Shang Dynasty 1600-1046 BCE, particularly the Late Shang, when pyroplastronomy and oracle bone and turtle shell inscriptions were used in divination, a Shang king shot and killed a softshell in Luohe, Henan. He then cast his feat in bronze. Judging from the distinct separation of neck and carapace, and the long nose, the softshell seems to be a *Rafetus*. (The nose of the giant *Pelochelys cantorii* is less prominent, and it is often referred to as the frog-faced softshell.)



Figure 9 Shang Dynasty Bronze Rafetus from Henan
(Courtesy of Wolfgang Behr)

There is an inscription on the carapace of the bronze image in rather enigmatic language:

1. [Cyclical day] bingshen: what the King captured when he made a halt at the Huan river.
2. The king shot once, [I,] ? Ban shot three times. Not one of the arrows missed the target.
3. The King ordered Kui (“Ubiquitous”), Keeper of the Inner Palace Apartments to bestow [it, this giant turtle] upon [me,] Archive Maker
4. Ban, saying: ‘Perform [this unusual event] on a yong-bell, make it your treasure. (Translation by Wolfgang Behr 2019)

丙申，王弋于洹，獲。
 王一射，奴射三，率無廢矢。
 王命寢廋貺于作冊
 般。曰：奏于庸，作汝寶。



Figure 10 Inscription in modern Characters and original rubbing
(Jinlu 967 – Courtesy of Wolfgang Behr)

Behr writes, “Apart from the dating by cyclical day, typical of oracle bone inscriptions in contrast to Late Shang bronzes, the inscription is highly unusual in how it describes an action that is also visible in the object itself: four arrows are sticking out of the turtle.”

Rafetus swinhoei is effectively extinct in Vietnam and China. In 2016 one of the last known living specimens, a female, the famous “Cụ Rùa” of Hoàn Kiếm Lake in Hanoi, died. One or two individuals survive at Đồng Mô lake and one at Xuân Khanh Lake, both near Hanoi. In China, after the last surviving female died in 2019, only one *Rafetus* remains in Suzhou Zoo in Jiangsu. It is possible that some may survive in the wild in the upper Red River basin in Yunnan where individuals are said to have been caught and released. One of the turtles that lived originally in Hoàn Kiếm lake was killed in 1967 by a fisherman. It had grown to a length of 1.9 meters and weighed 200 kilograms. Its plastinated body was preserved Lenin-style, in the Temple of the Jade Mountain on an island in the lake. Now Cụ Rùa lies along side. Another specimen was reported from the Mã River in Thanh Hoá (Lê et al. 2014).



Figure 11 The enshrined bodies of two *Rafetus* from Hoàn Kiếm Lake in Hanoi, Temple of the Jade Mountain

(Source: <https://e.vnexpress.net/news/news/vietnam-s-legendary-giant-turtle-plastinated-for-life-3896297.html> [Last Access: Nov. 25th, 2020])

Some Vietnamese writers have identified this turtle with the story of a turtle god associated with King Lê Lợi who was said to have been given a sword by the turtle. The story sounds suspiciously close to the more ancient one associated with *Cuora trifasciata*, also called “golden turtle” in Vietnamese and Lao. In fact, the specimens described by Bourret (1941) in his seminal work on the turtles of Indochina, were

found on Mount Tam Đảo, the very site of the famous battle between the white chicken and the golden turtle associated with the construction of the Cổ Loa citadel by King An Dương (Taylor 1983: 21-23).

Briefly, following Taylor, the Hung Kings who ruled over the Lạc Lords, were defeated by King An Dương or Thục Phán. He was supported by chieftains of the Ou-Yue (Western Ou), and together they established themselves in Cao Bang. Then Ou (Âu) merged with Luo (Lạc) and formed the kingdom of Âu - Lạc. An Dương built a citadel at Tây Vu known as Cổ Loa, and during the process the construction was undone each night by a thousand-year old white chicken from the nearby Mount Tam Đảo. A “Golden Turtle” came to the assistance of King An Dương, defeated the White Chicken and remained with the king until the citadel was completed. When he departed, the turtle left behind a claw to be used as a trigger on the king’s crossbow, to insure he would always defeat his enemies. The crossbow was named, “Sainly Crossbow of the Supernaturally Luminous Golden Claw” (*ibid*).



Figure 12 *Cuora trifasciata*, the original golden turtle
(Source: The Turtle Conservancy <https://www.turtleconservancy.org/home>
[Last Access: Nov. 25th, 2020])

In China, *Rafetus*, called the *yuan* (OCM *ɲon or *ɲwan) turtle, was believed to drown people and horses and to rape women (Eberhard 1968: 199-20). It was also reported that women while bathing would turn into a *yuan* turtle (*ibid*). A *yuan* turtle living in a spring in Guangdong was thought to possess a bronze girdle and would cause “salubrious” rains if its waters were defiled (Schafer 1967: 214).

Eberhard (1968: 200) also reports a rain-providing turtle god *mu-chü-shih* in southern Hunan. Its temple has an *ao* turtle mouth (but note the *ao* turtle is usually considered a mythical sea turtle, or, according to Schafer (1967), it was the name of the leatherback turtle *Dermachelys*, whereas Hunan is a land-locked province). Eberhard (*ibid*) writes there were many such deities in Jiangsu province to whom cattle sacrifices were made in times of illness.

Other potential large mysterious creatures living in the water include the following though they are not readily identified.

Carr's (p.c.) 'giant salamander' forms from the Erh-Ya.

16/ 41a	*ŋieg / ŋiei / yi
16/41b	*g'a / ʔa / hia (Karlsgren 33i *g'ǎ) Baxter-Sagart *[g]ʔra 'hia-ma frog' 蝦

Schafer (1967: 111) identifies the first form as a *Yu* from the literature of the Zhou Dynasty, but not described until the Han period. It was called variously "water crossbow; sand mother; shadow shooter; shooting artist; and short fox." Alternatively it could be,

Karlsgren 929r *g'wək / ʔwək / huo , or, *giwək / jiwək / yü
'a fabulous nocuous water animal, water demon'

Schafer treats it as an insect, but Eberhard (1968: 193ff) writes that the *yu* creature is born from the sperm of the "speckled mountain people" who have intercourse out of doors like animals, a sin in the eyes of the Chinese. The *yu* he says looks like a "yellow bear", but he assumes it to be an error because in his sources the two words *hsiung* 'bear' and *neng* 'turtle (pieh [=softshell]) with three legs' look similar.

Chang Heng in the 2nd century A.D. reported such a turtle living in the river I (*Tung-ching-fu*). *Chien-hu-chi* (Part 9, chapt. 4, 12a) proposes a pronunciation of nai or t'ai for this neng, describes it as a three-legged turtle, the animal which always, together with the snake, is regarded as a cosmic symbol. Its meat is supposed to be poisonous. (*ibid*)

The semantic variation in 41b may result from applying an inland mountain stream term to a more coastal environment as the character has come to be used in compounds meaning 'shrimp, prawn, lobster.' In any event, we do not have good lexical data for 'giant salamander' which should be easily available if linguists were to explore such terms, especially in Kra, Kam-Sui and Chinese as it is a highly conspicuous animal, especially in Guizhou. It is the world's largest amphibian attaining lengths of up to six feet. So far linguists working on Kra-Dai languages seem to have been unaware of its existence with the sole exception of the Mahidol University team that worked on Sui as cited below.

Keightly (1978) believes the plastrontic tradition originated further south perhaps from the lower Yangtze valley. Berry (1978) discovered that only one of the species that could be identified was local (*Geoclemys reevesi*), the rest of the plastrons are from southern species, and one, *Testudo* [*Manouria*] *emys*, from southern Southeast Asia. There must have been an active trade in turtles at the time, more than 3,000 years ago.

Further south in Thailand, the etymology of the strange Siamese word for softshell, *taphaap naam*, ตะพาบน้ำ is unclear, and why is the word *naam* 'water' always included? McFarland's dictionary notes the term *phraɔtaphaap* พระตะพาบ which is a royal vocabulary term for a bulbous long-necked water jug called *khon thoo* คนโท or *kun thoo* กุณ โท in the ordinary language. *phraɔtaphaap* is also used for sacred amulets

that are suggestive of a softshell shape, or an actual depiction of a softshell turtle complete with legs and a long nose, often with the image of a famous monk inscribed in sitting position upon the carapace. The water jug is used for drinking water, or for pouring water on sacred objects in ceremonies, so that may account for why the ‘water’ morpheme is attached. Perhaps the shape of the water jug is reminiscent of the softshell or vice-versa? Much of the Siamese royal lexicon derives from Khmer, but in this case a corresponding Khmer term cannot be found. In Siamese the softshell is classified as a turtle *taw B2* as in *taw B2 taphaap DL4*, rather than a fish as in Lao *paa A2 faa A1*, or as simply an animal (*tua, too, tuu*), as in most other CSWT languages, for example BT *too A2 faa A1*.



Figure 13 Softshell amulets from Thailand called “Phrataphap” in Siamese. The second from the left is an actual deceased juvenile softshell preserved to serve as an amulet.

(Sources:

[https://www.google.la/search?q=พระ](https://www.google.la/search?q=พระตะพาบ&hl=en&sxsrf=ALeKk03P7fzjEVE76gjMINhGtXnng9jCJg:159927565050530&source=lnms&tbm=isch&sa=X&ved=2ahUKEwjPx7CIhtHrAhVDjuYKHdGCCUYQ_AUoAXoECAwQAw&biw=1459&bih=1041#imgrc=Kq-obj4Hsb8dtCM)

[ตะพาบ&hl=en&sxsrf=ALeKk03P7fzjEVE76gjMINhGtXnng9jCJg:159927565050530&source=lnms&tbm=isch&sa=X&ved=2ahUKEwjPx7CIhtHrAhVDjuYKHdGCCUYQ_AUoAXoECAwQAw&biw=1459&bih=1041#imgrc=Kq-obj4Hsb8dtCM](https://www.google.la/search?q=พระตะพาบ&hl=en&sxsrf=ALeKk03P7fzjEVE76gjMINhGtXnng9jCJg:159927565050530&source=lnms&tbm=isch&sa=X&ved=2ahUKEwjPx7CIhtHrAhVDjuYKHdGCCUYQ_AUoAXoECAwQAw&biw=1459&bih=1041#imgrc=Kq-obj4Hsb8dtCM) ; and:

[https://www.google.la/search?q=พระ](https://www.google.la/search?q=พระตะพาบ&hl=en&sxsrf=ALeKk03P7fzjEVE76gjMINhGtXnng9jCJg:159927565050530&source=lnms&tbm=isch&sa=X&ved=2ahUKEwjPx7CIhtHrAhVDjuYKHdGCCUYQ_AUoAXoECAwQAw&biw=1459&bih=1041#imgrc=0NxWAEKwHvnbIM)

[ตะพาบ&hl=en&sxsrf=ALeKk03P7fzjEVE76gjMINhGtXnng9jCJg:159927565050530&source=lnms&tbm=isch&sa=X&ved=2ahUKEwjPx7CIhtHrAhVDjuYKHdGCCUYQ_AUoAXoECAwQAw&biw=1459&bih=1041#imgrc=0NxWAEKwHvnbIM](https://www.google.la/search?q=พระตะพาบ&hl=en&sxsrf=ALeKk03P7fzjEVE76gjMINhGtXnng9jCJg:159927565050530&source=lnms&tbm=isch&sa=X&ved=2ahUKEwjPx7CIhtHrAhVDjuYKHdGCCUYQ_AUoAXoECAwQAw&biw=1459&bih=1041#imgrc=0NxWAEKwHvnbIM))

One explanation for the Buddhist association is that softshells and other turtles are believed to be primarily vegetarians and their release into temples or into the wild is a merit making activity.

7. Summary of Comparative Linguistic Evidence

Chinese Softshell Lexicon

1. *kiweg / k.jwi /- kuei (985a) ‘Tortoise’ (ie. Hard shell) (Karlgren)

guī 龜 (kwji) ‘tortoise, turtle’ LH ku~kui , **OCM *kwrə** (Schuessler)

This is provided here for contrastive purposes only, as it marks a fundamental distinction between hard-shelled and softshell turtles.

2. xī 蠍 ‘big turtle’ (yiwei) LH yue , **OCM *wê** (Schuessler)

蠍龜 / 蠍龟 (xīguī) in compound so not the same word as kwei

Same as:

Karlgren 880d *g’weg / yiwei / hi ‘big tortoise’

Pulleyblank 142:18 Y. xī, xí L. xh̄jyaj E. ywej ‘sea turtle’

Sino-Vietnamese *giải* ~ *giải* ‘giant softshell’

3. yuán 鼇 ‘big turtle’

鼇魚 yuán yú ‘softshell turtle’ = 鰲 [bie]⁵

Pulleyblank Y. ɣen L. ɲyan E. ɲuan ‘*Pelochelys bibroni*’⁶

yuán 鼇 (ɲjwən) LH ɲyan **OCM***ɲon or *ɲwan ‘large turtle’ (Schuessler)

Schuessler also notes a possible relationship to:

áo 鰲 (ɲâu) LH ɲau **OCM***ɲâu ‘turtle’, the final nasal having been lost due to a process of back formation (Schuessler 594). *Áo* was a mythological marine turtle thought to live in the South China Sea.

4. Karlgren 929r *g’wək / ɣwək / huó , or, *g̣iwək / j̣iwək / yü
‘a fabulous nocuous water animal, water demon’

5. 鰲, 鼈 biē MC pjiet (p- + -jiet D) OC *pet ‘softshell turtle’ (Baxter-Sagart)

A match is found preserved in the Toum-Ruc subgroup of the Mol-Toum branch of Kri-Mol (Chamberlain 2018). Possibly it is the result of interaction with the Chinese commandery at Jiude (Cửu Đức) in Hà Tĩnh at the mouth of the Cửa Sót River, or

⁵ <https://chinese.yabla.com/chinese-english-pinyin-dictionary.php?define=%E9%BC%8B>
[Last Access: Nov. 25th, 2020]

⁶ In the not so distant past, *P. bibroni* was often used for *P. cantorii*.

Huai Huan (Hoài Hoan) at the mouth of the Cả River in Nghệ An, both of which were established in the Han Dynasty and are adjacent to this subgroup.

Further south, where the Cheut languages are found, the southernmost Han outpost of Rinán 日南 (formerly Jih-nan) or Nhật Nam in Vietnamese was located between Quảng Bình and points south, but the northern portion was more well-established based on the presence of Han tombs along the Giang River in Quảng Bình (Taylor 1983:54).

It must have been an item of trade. Cognates do not occur in other Kri-Mol languages, or other branches of Austroasiatic so far as the author is aware.

Phong:	tu peet	‘softshell turtle’
Toum:	tu peet	‘small softshell turtle’
Liha/PL:	tu peet	‘softshell turtle’
Liha/SM:	tu peeʔt	‘softshell turtle’
Brou (Katuic)	piit	‘softshell turtle’

The Brou cognate may indicate a more northerly origin for that language as Makong, at least, occurs in Quảng Bình next to Cheut languages. Furthermore, the word is not found in other Katuic languages.

The forms all have the monophthong as in OC. None of the Chinese forms are found in Hlai.

These groups were also living adjacent to Tais (Nyo) from whom they borrowed the ‘animal’ (UB) marker /tuu A/. Softshells are not classified as turtles (ᵛᵛ, ᵛᵛᵛ, ᵛᵛᵛᵛ respectively) here as they are in the Nrong-Theun languages.⁷

These Phong-Toum-Liha languages are located in Laos along the border with Nghệ An and Hà Tĩnh, and closely related languages are found in those provinces. The form is not found in other subgroups. It may have been borrowed via Hlai, who lived on the mainland at that time, in which case I note the name of /ʔǎi³/ ‘exonym for Malieng’ in the Mày language, also in Hà Tĩnh Province (Бабаев and Самарина 2018) and a close match for Old Chinese and Proto-Hlai reconstructions for the name of the Li people:

Baxter	*C.rəʔ 李,	*C.r[ə]ʔ 梨
Schuessler	*rəʔ 李,	*rəi 梨
Norquest		*hləy A (pre-Hlai *ləy A)

This must also be cognate with Kri (Mày /ʔi¹/), a Kri-Mol language from another branch spoken nearby, as well as in Nakai in Laos. These ethnonyms plus the softshell terms provide additional evidence that it was from these shores, Hà Tĩnh, Nghệ An, and possibly Thanh Hoá (Jiuzhen [Cửu Chân] at the mouth of the Mã) that the Hlai sailed to southwestern Hainan. (See also Ostapirat 2008)

⁷Another Chinese or Northern Tai connection is found in Phoong, a language related to Kri in Nakai, but which is also found in Hà Tĩnh (see **gũi** above): (ᵛᵛ) kwii ‘big-headed turtle *Platysternon megacephalum*’.

6. Liu’s “nei” is probably 鯢 ‘salamander’ MC *ɲei* OC *ɲe*: [**ɲáj*] (Zhengzhang), Mandarin *ní*, likely the same word as **nǎy(?)*. Perhaps it was *nəu* or *nəuɣ*, retaining the retraction and conditioning the raising of the the vowel. The onset is more difficult to explain, but the **ɲ-* > *n-* here is inescapable. Cantonese is *ɲaj4*. The phonetic in 鯢 is ‘child’ seemingly in agreement with the infant-like vocalizations of the giant salamander, and to an alternate name of 娃娃魚 (*wáwáyú*) or ‘baby fish’.

Another possible character for the “nei” term given by Liu above for giant salamander is 熊, Pinyin *nái*, *néng*. It is described by Eberhard as the three-legged turtle or “yellow bear”

MC <i>*noj</i>	‘three-legged softshell’ (Baxter and Sagart 2014)
OC <i>*nuu:</i>	‘a three-legged soft-shelled turtle’ (Zhengzhang 2003)
OC <i>*nʰə(ɲ)</i>	‘a kind of bear’ (Baxter and Sagart 2014)

In an online discussion of a paper by Shuheng Zhang (2019) Chris Button suggests 熊 OC **nəɲ?* (becoming **nǎy?* and **nǎɲ*) ‘(aquatic) animal – possibly soft-shelled turtle.’ But given Liu’s identification in the field, there is little doubt that the original meaning was ‘giant salamander.’ In the same discussion Jonathan Smith cites a first occurrence of 鯢魚 ‘salamander’ in the western Han.⁸

Kra-Dai and Austronesian

PAN	<i>*qaCipa</i> (Blust) <i>*qatipa</i> (Wolff)
Proto-Kra-Dai	<i>*Cipa:</i> (Ostapirat)
Proto-Kra Lachi	<i>*pa:</i> -pu: (Ostapirat p.c.)
Proto-Hlai Bai-sha	<i>*faa</i> <i>faa</i> ³³ ‘sea turtle’ (Wang and Qian 1951)
Proto-Kam-Tai	<i>*k-p-</i> (Ostapirat p.c.)
Proto-Kam-Sui (?) Sui Tingpai T’en	<i>*f^ua:</i> / <i>*f^ha:</i> -fia (Ostapirat p.c.) -fjaa (Li 1968)
Proto-Tai SW	<i>*β^ha:</i> (Ostapirat p.c.) <i>faa</i>

⁸ The Language Log, November 19, 2019 <https://languageblog.ldc.upenn.edu/nll/?p=45051>

	C	faa
	N	fua ~ fuuu (Dioi: voueu)
	Liujiang	hu ³ (Meng Yuanyao p.c.)
	Sek	via
Unrelated:	Laqua (Pubiao)	pa ¹ tăw ¹ [fish+turtle]; ‘softshell turtle’ kapông ² (Hoang et al. 1992)
	Red Gelao	vu ³⁵ kuxi ^{25?} < Chinese (Mazo et al. 2011) ‘softshell’

Additional Kam-Sui forms:

Róngjiāng Zhāngglǔ Southern Dong	Long and Zheng 1998	pjin ³²³	tortoise 烏龜
Tiānzhù Shídòng Northern Dong	Long and Zheng 1998	wu ³³ kiu ³³	tortoise 烏龜
Kam	Mahidol 2000	pjin ³²³	鳖 softshell turtle <i>Trionyx</i> ⁹
Sui	Mahidol 2003	mom ⁶ tjaau ⁵ [fish+turtle]	softshell turtle <i>Trionyx</i>
		taam ⁴	鳖 turtle ตะพานน้ำ (softshell)
		tjaau ⁵	鳖 softshell <i>Trionyx</i> ตะพานน้ำ
Sui Tingpai	Ostapirat	(fit ⁷) fia ¹	Softshell turtle
T’en	Fang-kuei Li	ne kau ¹³ fjaa ³⁵	‘kind of turtle’ (Lit. ‘owl turtle’)

⁹ May be cognate with Nyuan (N. Thailand) paa bian ‘softshell turtle’.

There remains some semantic confusion apparently as a result of the Chinese glosses for KS languages. It would be expected that forms such as Sui *tjaau*, cognate with Siamese *taw* would refer to hard-shelled species of turtles or tortoises. Yet the Chinese gloss in the Mahidol volume on Sui is ‘softshell turtle bīe 鳖’. Another example is Kam /pjin³²³/, glossed ‘tortoise 烏龜’ in Róngjiāng Zhānglǚ dialect (Long et al. 1998) but ‘鳖 softshell turtle *Trionyx*’ in Mahidol (2000), as if the two glosses are synonymous. In addition, Chinese language materials consistently gloss guī 龜 as ‘turtle’, but wū guī 烏龜 as ‘tortoise.’ The author is unsure of the function of wū in this context and why it is used to distinguish “turtle” and “tortoise.”

By itself wū means ‘crow’, perhaps a metaphor for the color black, or perhaps a reference to the peculiar shape of the softshell turtle face, similar to the T’en form ‘owl turtle’ in the list above. True tortoises (as defined in the beginning of this paper) are rare in China so it is doubtful that is the intended meaning, and in any event, when necessary can be designated as lu guī 陆龟.¹⁰ Perhaps a convention evolved in Chinese-English lexicography that accounts for this? If so it might have arisen from the old 19th c. English usage of Swinhoe and others referring to softshells as “mud tortoises.” In any case it gives rise to some ambiguity as to the meaning of the Kam-Sui glosses for hard-shelled and soft-shelled turtles.

In Kra, Red Gelao (Mazo et al. 2011) has borrowed the 烏龜 term as /vu³⁵ kuxi²⁵²/ meaning ‘Chinese softshell’, as distinct from /thun³¹ zyi³¹/ in the same language glossed as ‘tortoise’ Chinese 烏龜 wū guī, with the Russian gloss ‘черепаха’ that makes no distinction between turtle and tortoise.

Kra-Dai, Austronesian and Austroasiatic

For the time-being, until additional information is forthcoming, we are left with the following distribution in Kra-Dai and Austronesian.

1. Proto-South-Central-Tai *top DS ‘*Pelochelys cantorii*’ or ‘*Refetus swinhoei*’

Black Tai (Meuang Mouay), White Tai (Donaldson et al. 1970.), and Tai Vat (Yên Châu): (too) top DS2 ‘Giant Softshell turtle’ *Pelochelys* or *Rafetus*’ (Chamberlain 1981)

Thay Neua of Meuang Vène, Houa Phan, Laos: (too A) top DS

Savina (1910) Tay: (tu) tốp ‘grande tortue d’eau douce’ *Tryonichidés*
Viet. con giải’

¹⁰ <https://zhuanlan.zhihu.com/p/30914213> Called to my attention by Norihiko Hayashi (p.c.) The same site notes that males of a certain species are black. But this is quite specific and seems to refer only to the Reeves turtle (Chinese Pond Turtle) though not identified as such.

Tay of Bach-Thông, Bắc Kạn (EFEO 1938): (tua) tốp ‘crocodile’¹¹

2. Proto-Hlai

***thu:p** ‘point-nosed turtle (Norquest)’

***?fi:p** ‘softshell turtle (Ostapirat)’

Hlai (Li from Stübel 1937)

Weiss: thöeb ‘turtle’

Geshor: thob ‘turtle’

3. Proto-Austronesian

PAN / PWMP (‘river tortoise, softshell turtle’)

***qatipa** (Wolff)

***qaCipa** (Blust)

Northern Philippines (Yap 1973)

Kallahan, Keleyqiq: kateb ‘turtle’

Ifugao, Rayninan: attob ‘turtle’

WMP (Philippines and Sumatra)

Pangasinan: ansipa ‘river turtle’ (Tsuchida1976:291)

Kapampangan: antipa ‘animals like turtles’

Simalungun Batak: antipa ‘sea turtle’ (Sumatra)

Formosan

Atayal: qesipa ‘softshell turtle *Trionix sinensis*
(Tsuchida 1976:266)

Thao: qθipa ‘softshell turtle *Amyda sinensis*’

Pazih: sipa ‘turtle’

Saisiat: kæ-ʔsipa? ‘tortoise’

Bunun: qasipa ‘turtle’ (spread secondarily – Wolff)

4. One possible etymology for ***top** is mentioned by Schafer (1967: 293) who calls attention to the Middle Chinese word for (giant?) salamander ***t’ap** 鰻 found in the 11th century rime dictionary *Guangyun* of Lu Fa-yen. We do not have an OC reconstruction. The modern meaning has become the saltwater fish ‘sole’ or ‘plaice’ (Mathews 5976), large fish that are flat and round, shaped roughly like a softshell, and which, like softshells, bury themselves in sand or mud on the sea bottom, implying a semantic shift from salamander to softshell to flat fish.

Notably, the former ranges of *Pelochelys* and *Ratefus* included the southern Chinese coast. The Austronesian connection, ostensibly an old one, suggests the

¹¹ Since there are no crocodiles found in any northern Vietnamese areas away from the coast, this is assumed to be an error in elicitation. Bắc Kạn is located southwest of Cao Bang.

word was borrowed into Chinese from Li on the mainland. If so, this would have occurred after the time that Li unaspirated stops became aspirated (Ostapirat p.c.).

Phonologically, the closest cognates occur on a line from northwestern Vietnam through Hainan to the northern Philippines. The irregularity of cognates within Taiwan noted by Wolff suggests secondary sources were involved.

5. The Vietnamese word *giài-giài* has no cognates in other Austroasiatic languages, nor in Tai or Hlai. It is used to refer to both species of giant softshells, at least in the north, and seems to be a term in use at least since the publication of Savina's Tay dictionary in 1910 where it is used as the Vietnamese gloss for Tay *tóp*, spelled "giài" with the *huyên* tone so the existing cognates are irregular. Neither variant occurs with this meaning in any of the Vietnamese dictionaries I have seen so far. The likeliest source of borrowing is Chinese *xī* 蠆 'big turtle' (yíwei) LH yue, OCM *wê (Schuessler) or the compound 蠆龜 / 蠆龟 (*xīguī*). Along the southeast China coast the word is applied to sea turtles, especially the loggerhead (*Caretta caretta*), in Cantonese pronounced *kwai*⁴.

Probably the ancient Tais did not make a distinction between *Rafetus* and *Pelochelys*, as is also the case with PT *faa A, a word that was applied to all species of smaller softshells such as those mentioned above. The outstanding feature of *cantorii* and *swinhoei* is their size. There may have been specific level taxa added to them, but these were not preserved for comparative purposes.

As noted above at least two other Chinese chelonian terms occur in Kri-Mol languages, both likely traded to local Chinese commanderies where demand must have been high. In all cases these terms are borrowed from Chinese.

5. Cham and Austroasiatic words for 'softshell'

Mainland Malayo-Polynesian

Cham		
Jarai	təpaa	(Lafont 1968)
Röglai	dərpa	(Shorto 2006)
N. Röglai	tupa	(Shorto 2006)
Malay	labi labi	
(Eastern) Mon-Khmer ¹²		
Pramic	*t(m/l)paa?	(Diffloth 1980)
Khmuic	*kpa	(Badenoch p.c.)
Bahnaric	*t(m/l)paa?	(Diffloth 1980)
Katuic	*(t/d)rpaa	(Diffloth 1980)
Pearic	*t()paa	(Diffloth 1980)
Pearic	*lphaa	(Diffloth 1980)
Kri-Mol		
Viet-Muong	*ba ba / pa pa	(Nguyễn Văn Tài 2004)

¹² "Eastern" here is used here in a strictly geographical sense. Elsewhere Khmuic and Pramic, are regarded as Northern MK.

Monic	*dwii?	(Diffloth 1980)
Nya Kur	*[c/t]hewii?	(Diffloth 1980)
Mon	*kwii?	(Diffloth 1980)

It would seem plausible, based on reconstructed PAN to assume that Cham, as a Malayo-Polynesian language resident on the mainland of Southeast Asia for 2,200 or more years, was a source of borrowing into Austroasiatic languages. It is especially close to reconstructed Kra-Dai ***Cipa**: as well. One probable Malayo-Polynesian cognate is Malay *labi-labi*, the generic term for softshell turtles in Malaysia and western Indonesia. An initial ***l-** is also found in the Pearic forms.

However, cognates occur only in Western Cham (i.e. upland Cham) and not in the coastal languages, at least so far as we know. And, the breadth and depth of Austroasiatic cognates could imply that Austroasiatic is the immediate source. Furthermore, it is clear that the upland Cham (Rhadé, Jarai, Chru, etc.) all possess substrata indicating their original language was not Cham. As Diffloth (2004) writes:

...these [mountain] Chamic languages are structurally typically Bahnaric and not Austronesian, and their vocabulary contains hundreds of Bahnaric items which are not borrowings but retentions from the earlier languages.

The situation leaves us with a geographical conundrum where this taxeme is concerned: (1) contact with Kra-Dai in the north followed by southward movement into Katuic and Bahnaric; (2) upland Cham was the result of a language shift from AA to AN and subsequent movement of the term was to the north into Khmuic and Pramic; or (3) the taxon was an areal word with a wide distribution through trade interactions.

It is worth noting that until recently itinerant Cham traders were common in Laos and it is possible that softshell turtles were an item of trade from the western to the eastern side of the Annamites. In the mountain habitats of the Katuic, Bahnaric, and upland Cham, there would have been no indigenous softshells so the limited distribution pattern of this taxon indicates that this was a trade word, similar to the ubiquitous *puuluu* the big-headed turtle (*Platysternon megacephalum*) whose name crosses linguistic boundaries in Laos, southern China, northern Vietnam, and Thailand. The above mentioned borrowing of OC ***pet** into the Phong-Toum subgroup of Kri-Mol is another good example.

Trade routes across the Annamites must have been numerous. But there is still some mystery. Why are there no Khmer cognates despite being surrounded by Bahnaric, Katuic and Pearic? Why are the Viet-Muong subgroup of Mol-Toum the only languages to contain cognates in Kri-Mol (Vietic). In any event, it can be safely assumed that the ultimate origins of these forms is Austronesian, despite being distributed via Austroasiatic, and despite the irregular reflexes of PAN ***qaCipa** (Blust) / ***qatipa** (Wolff) being unexplained.

8. Discussion

The ***top** etymon is important. The giant turtles to which it referred had an original mainland distribution that encompassed the large river systems of Vietnam and Southern China, as well as Hainan and northern Luzon. Today both species have been hunted almost to extinction on the mainland. Cognates occur only in Central and SW Tai, Hlai, and Austronesian, with PAN reconstructions by Wolff and Blust. Apart from *giài* or *giài*, a Chinese borrowing, there are no indigenous Vietnamese or Muong forms for this highly conspicuous turtle as would be expected if either of these language groups had inhabited the Red River basin in ancient times. (There should be a word for *Pelochelys* in Khmer further to the south, and in Island Southeast Asia, but none has been found so far.) The furthest west the taxon has been reported is from Meuang Vène on the Nam Xam (Sông Chu) river in Houa Phan Province, Laos.¹³

Besides this, there is little information regarding the occurrence of terms for giant softshells in the Mã or Cả or other large rivers to the south, but then the Tai languages there are poorly studied. In northern Vietnam the etymon is reported from Son La, Lai Châu, Lào Cai, and Bắc Kạn, encircling the delta of the Red River into which the Vietnamese pushed no earlier than the 10th century CE. The peopling of the delta prior to this is a Kra-Dai affair, beginning with Hlai and Kra (Li-Lao) and then waves of first Luo-Yue (CSW Tai, the Lạc of Vietnamese history books) and Ou-Yue (NT Branch Nyo and Yi, the Âu in Vietnamese History) (Chamberlain 2016). Those displaced first by the Hlai were probably Hoabinhian Negritos such as co-inhabited sites like Mán Bạc (1,850–1,650 BCE) in Ninh Bình Province where “large softshell” remains (*Trionychidae*) were common (Hung 2019; Toizumi 2011).

The question that now emerges is how can we explain the distribution of this etymon from the CSW Tai languages in the basins of the Red the Black, the Clear, the Mã and the Chu Rivers of northern Vietnam, the Hlai languages of Hainan, and the Austronesian languages of northern Luzon, and Taiwan, with a single occurrence in southern Sumatra showing a semantic shift to ‘sea turtle.’

Large softshells are necessarily lowland creatures, living in large rivers or lakes. Because of their size, they cannot reside in upland streams or brooks. Their occurrence in the big rivers is reported by Tai speakers in northwestern and central northern Vietnam (Chamberlain 1981). *Rafetus* has been described as occurring in Hòa Bình, Thanh Hóa, Thái Bình, Phú Thọ, and Yên Bái (Bettelheim 2012), and Bắc Giang¹⁴ provinces. These latter are from descriptions by fishermen all of whom were probably aware of the famous Hoàn Kiếm Lake turtle, so there may be some confusion as to the identity, whether *Rafetus* or *Pelochelys*. In Vietnam, information on occurrence of *cantorii* is difficult to find as both specialists and amateurs are overly focused on the more newsworthy Yangtze Giant Softshell

¹³ A giant softshell, species unknown, is reported from the village of Ban Teuam where a *vang* ‘wide and deep place on the river’ is located, named the “Vang Top” after the softshell that used to reside there. Villagers decided to kill the turtle because they were afraid it would eat the children who liked to swim here. Its occurrence in the Nam Xam (Sông Chu) makes sense as it has been reported from the basin of the Mã, the next river to the north, of which the Chu is eventually a tributary.

¹⁴ <https://www.facebook.com/AsianTurtleProgram/posts/1170204619680044/>

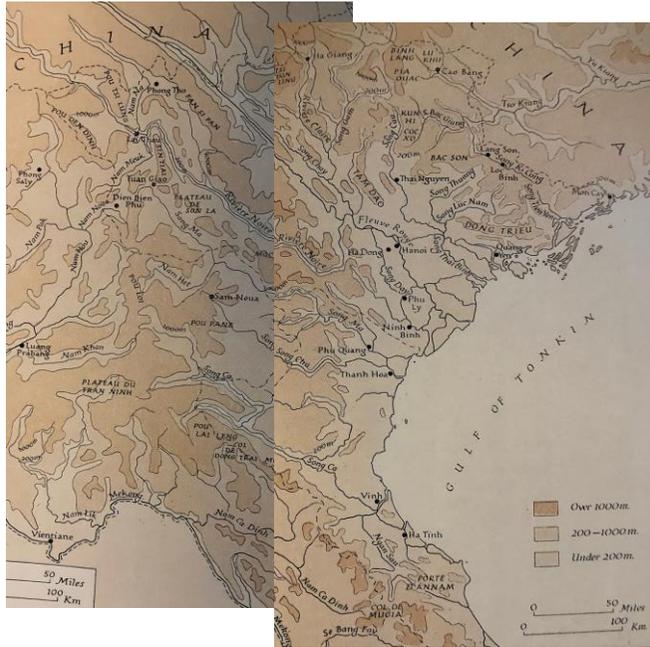


Figure 14 Rivers of northern Vietnam
(Source: UK Naval Intelligence 1943)

P. cantorii is reported from the Cagayan basin in northern Luzon. The most recent observations as reported by Brown et al. (2013) were in Cagayan and Isabela Provinces. The basin encompasses portions of Ifugao where a cognate form is reported from that language, and in nearby Kallahan/Keleyqiq. To the southwest is the Agno River basin where another cognate has been reported from the Pangasinan language (Yap 1973).



Figure 15 A young *Pelochelys cantorii* from the Cagayan Basin
(Source: Brown et al. 2013)

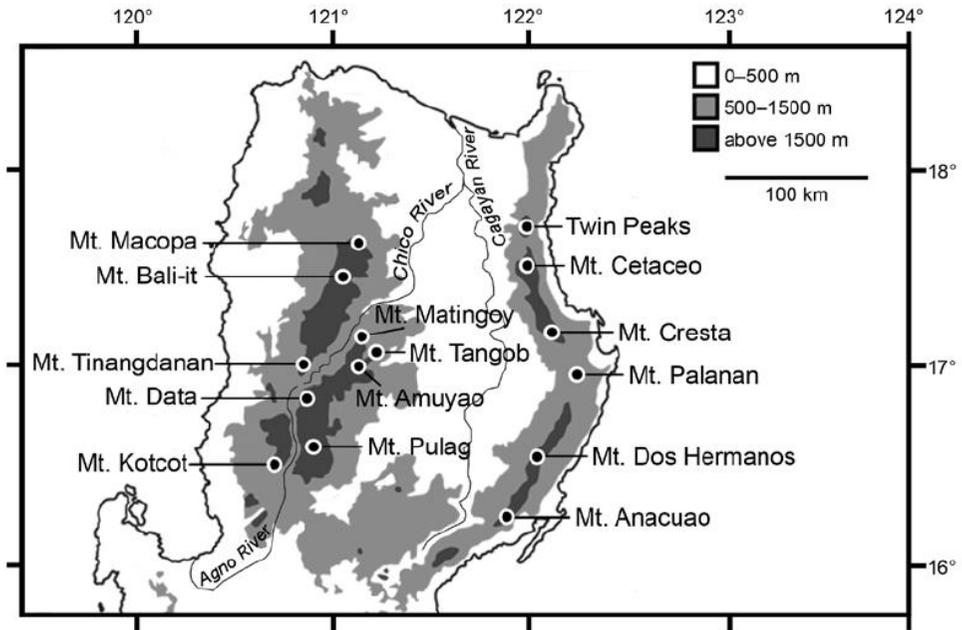


Figure 16 Northern Luzon River basins and elevations. Note especially the Cagayan and the Agno (Source: Balete et al. 2012)

On Hainan where four main rivers flow from the central highlands to the coast in the cardinal directions (Liu et al. 2016), *P. cantorii* is reported from the Yinggeling Nature Reserve that lies in a mountainous area between the Nandu and the Changhua Rivers, site locations indicating that it is found in both rivers, although its conservation status is listed as critically endangered (Wan et al. 2015).



Figure 17 Rivers of Hainan (Source: Liu et al. 2016)

This South-Central Tai-Hlai-Austronesian link becomes even more interesting when we note that term does not appear in the Northern Branch of Tai, nor in Kam-Sui. We do not know in the case of Ong-Be, a related language on Hainan. There may be other examples of this connection not yet discovered. A partially similar case arises with Python (Chamberlain 2019a) where Lung Ming /laan C4/ corresponds to Proto-Hlai *C-naap?, but here the Austronesian link is missing. And in Chamberlain (2019b) a much broader correspondence involving Austroasiatic (Kri-Mol and Pakanic), Kra (Gelao), Jiamao (an isolate), and Austronesian (Oceanic and some Negrito languages), where the taxon for ‘snake/worm’ agrees across a broad expanse of mainland and islands, also including northern Luzon where cognates are preserved in the Negrito languages of Agta and Arta, coincidentally in the same areas where *Pelochelys* cognates occur in the basins of the Agno and the Cagayan respectively already mentioned.

Since Hlai (Li) must have predated CSWT in the Red River Basin, it is probable that Tais acquired the term for giant softshell from that language. But CSWT, the Luo Yue of history, would have encountered Hlai (or Li < Rei) quite early, in what was to become southern Lingnan and Annam. Hlai migrations to Hainan are thought to have occurred around 1,500 BC, before the invention of iron and crossbows (Ostapirat 2008). This date is quite early, and assumes the Li (or Kra-Hlai = Li-Lao) were early inhabitants not only of Lingnan and the Red River Basin, but also of points south in Thanh-Hoa, Nghe-An and Ha-Tinh. If there were old established sailing routes between Hainan and Luzon this could account for the spread of the term.

In spite of irregularities in the Formosan correspondences pointed out by Wolff and the dearth of MP cognates, it is still likely that the term spread from Taiwan via N. Luzon westward and not the reverse. So far, apart from northern Luzon, the only other cognate is from southwest Sumatra, and from only a single language, referring to a ‘sea turtle.’ This is probably the result of sea trade given the close resemblance of the Pangasinan and Sumatran forms, especially taking into consideration the reputation of the Pangasinan peoples as seafarers. If, as I suggest, Malayan *labi-labi* is a cognate then the PAN reconstruction may have to be revised.

Schafer’s MC *t^hap ‘giant salamander’ is no doubt a cognate, but the aspiration implies it was borrowed from Hlai/Li on the mainland sometime later, after Hlai voiceless stops acquired aspiration.

The truncated forms of the Cagayan Valley have voiced intervocalic -p- to -b- and subsequently lost the final -a. Although the Cagayan Valley is located on the eastern side of northern Luzon, it was apparently from this location that this form was spread westward to the mainland of Southeast Asia. The Agno Valley forms on the western side of Luzon more closely resemble the Taiwanese ones, but have added a nasal to the initial syllable. At the Nagsabaran site in Cagayan valley, remains of two distinct species of softshell turtles, *Dogania subplana* (the Malayan Softshell) and *Pelochelys cantorii* were identified from the early Neolithic layers 2200 to 1000 BC (Amano et al. 2013) so the presence of the large species there, rather than in Taiwan, is well-attested and the dating fits well with the Hlai peopling of Hainan.

One other location for *Rafetus* indicates a wider inland distribution in the past, that is, Changsha in Hunan, as mentioned above, where a female was found in a zoo in 2007 (Bettelheim 2012). The zoo had purchased the turtle from a traveling circus

so its exact origin is unknown, but ostensibly it was from the immediate vicinity. This turtle became the well-known “China Girl” that was used for the captive breeding program and died recently as a result of over-anesthetizing during the artificial insemination process (*ibid*).

9. Conclusion

CSWT’s lexical distinction between large and small softshell turtles indicates long residence in ecologies where both types occur. In Hainan, Hlai (Pai-sha [Báishā]) distinguishes ‘sea turtle,’ *faa* (A) (Wang and Qian 1951) from ‘softshell turtle’ *ʔti:p (Jiamao duəp⁹), but, as with the etymon for the ‘salt-water crocodile’ which was never acquired by Hlai, that lexical shift must have occurred independent of CSWT.¹⁵ Both are distinguished from ‘(hard-shelled) turtle/tortoise’ **Pre-Hlai** *tu:fi, **Proto Hlai** *thu:fi ~ **Proto-CSWT** *taw, (Jiamao də:w¹) Wang and Qian’s (1951). Bai-sha has *t’vu* glossed as ‘land tortoise’ by Jeremiassen (1893) which supports the author’s hypothesis of 1981 that the original meaning of *taw **B** was ‘land tortoise.’ Proto-Be has *du:^{BC} (Chen 2018), while *kwii* in NT is ‘freshwater (hard-shelled) turtle’; *faa **A** was ‘softshell turtle (general)’ and *top was ‘giant softshell.’

The CSWT-Hlai connection for *taw* does not match that of *top*, as it does not extend to Luzon nor to Austronesian, but is found with some semantic variation in Kam-Sui. Significantly, it is not found in NT. This implies that the Luo-Yue penetration into the mainland Li population occurred independently of Ou-Yue movements that must have arrived later. Cognates for NT *kwii*, an obvious Chinese contact form, are not found in Hlai.

Overall the increasing amount of evidence linking mainland languages (Kra-Dai, Kri-Mol, Pramic, Pakanic) with Hainan (Hlai, Jiamao), Luzon and Polynesia (Formosan, Western Malayo-Polynesian, Oceanic) supports a robust sailing connection as has been described elsewhere. In the case of terms for large softshells, the distribution is limited to just three locations. Proto Kra-Dai *Cipa and Proto-Central-Southwestern-Tai *top, both derive from the same PAN root, via different routes from separate locations. Nevertheless, irregularities in the reflexes of the daughter AN languages, and paucity of Malayo-Polynesian cognates have yet to be explained.

¹⁵ Pai-sha county is located inland, not on the coast so the gloss may be problematic, unless it is a more widely known word that is common in all dialects but not well-recorded by linguists.

Abbreviations

AA	Austroasiatic
AN	Austronesian
BCE	Before Common Era
BP	Before Present
BT	Black Tai
C	Central (Tai)
CE	Common Era
CSWT	Central Southwestern Tai
KS	Kam-Sui
LH	Late Han
MC	Middle Chinese
MP	Malayo-Polynesian
N	Northern (Tai)
OC	Old Chinese
OCM	Minimal Old Chinese
PAN	Proto-Austronesian
PT	Proto-Tai
PWMP	Proto-Western Malayo-Polynesian
SW	Southwestern (Tai)
UB	Unique Beginner

References

- Amano, Noel, Philip J. Piper, Hsiao-chun Hung, and Peter Bellwood. 2013. Introduced Domestic Animals in the Neolithic and Metal Age of the Philippines: Evidence From Nagsabaran, Northern Luzon. *Journal of Island & Coastal Archaeology* 8.317–335.
- Бабаев, К.В., И.В. Самарина. 2018. Язык Май: Материалы Российской Вьетнамской Лингвистической Экспедиции. Выпуск 5. Москва: Издательский Дом ЯСК. (K.V. Babaev and I.V. Samarina. 2018. Mày Language: *Materials of the Russian Vietnamese Linguistic Expedition*. Series 5. Moscow: YSK Publishing House.)
- Balete, Danilo S. et al. 2012. *Archboldomys* (Muridae: Murinae) Reconsidered: A New Genus and Three New Species of Shrew Mice from Luzon Island, Philippines. *American Museum Novitates* 3754. 1-60.
- Baxter, William H. and Laurent Sagart. 2014. *Old Chinese: A New Reconstruction*. New York: Oxford University Press.
- Behr, Wolfgang. 2019 (forthcoming). Inscription Placement, Ineffability of Language and Discourses on Hiddenness: Marginalia on the Prehistory of Subtlety (wei) in Early China. in: Henriette Hofmann, Barbara Schellewald, Sophie Schweinfurth, and Gerald Wildgruber eds., *Enthüllen und Verbergen in der Vormoderne / Revealing and Concealing in the Premodern Period*, München: W. Fink.

- Berry, James. 1978. Identification of the inscribed turtle shells of Shang. In Keightly, David N. ed. *Sources of Shang History: the Oracle Bone Inscriptions of Bronze Age China*. Berkely: U. of California Press.
- Bettelheim, Matthew P. 2012. Swinhoe's Softshell Turtle (*Rafetus swinhoei*): The Legendary Sword Lake Turtle of Hoan Kiem Lake. *Bibliotheca Herpetologica* 10.1. 4–20.
- Blust, Robert. 2002. The History of Faunal Terms in Austronesian Languages, *Oceanic Linguistics*, Volume 41.1. 89-139.
- Blust, Robert and Stephen Trussle. 2018. *The Austronesian Comparative Dictionary*. <http://www.trussel2.com/acd>.
- Bourret, René. 1941. *Les Tortues de l'Indochine*. L'Océanogr. l'Indochine, Note 38.
- Brown, Rafe M. et al. 2013. The amphibians and reptiles of Luzon Island, Philippines, VIII: the herpetofauna of Cagayan and Isabela Provinces, northern Sierra Madre Mountain Range. *Zookeys* 26. 1-120.
- Chamberlain, James R. 1977 *An Introduction to Proto-Tai Zoology*. Ph.D. Dissertation, University of Michigan, Ann Arbor.
- _____. 1981. Proto-Tai Zoology: Chelonians. *Péninsule* 2. Avril. pp 245-282.
- _____. 2016. Kra-Dai and the proto-history of South China and Vietnam. *Journal of the Siam Society* 104.27-77.
- _____. 2018. *A Kri-Mol (Vietic) Bestiary: Prolegomena to the Study of Ethnozoology in the Northern Annamites*. Kyoto Working Papers on Area Studies No. 133. Kyoto University.
- _____. 2019a. History that Slithers: Kra-Dai and the Pythonidae. *Southeast Asian Studies*, Vol. 8, No. 1, April 2019, pp. 25-51.
- _____. 2019b The word for 'snake' in Thémárou, Bolyu, Bit, Kra, Jiamao, and Oceanic: A Lapita Connection? In Norihiko Hayashi (ed.), *Topics in Middle Mekong Linguistics*. 1—38. Kobe City University of Foreign Studies.
- Chen Shu, Andrew A. Cunningham, Gang Wei, Jian Yang, Zhiqiang Liang, Jie Wang, Minyao Wu, Fan Yan, Hanbin Xiao, Xaviar A. Harrison, Nathalie Pettorelli, and Samuel T. Turvey. 2018. Determining threatened species distributions in the face of limited data: Spatial conservation prioritization for the Chinese giant salamander (*Andrias davidianus*). *Ecology and Evolution* 8 (6). 3098-3108.
- Chen Yen-ling. 2018. *Proto Ong-Be*. Ph.. Dissertation. University of Hawaii.
- Diffloth, Gérard. 1980. *Etymological Dictionary of Mon-Khmer: Chapter 1-Fauna*. Unpublished mss, University of Chicago.
- _____. 1984. *The Davarvati Old Mon Language and Nyah Kur*. Bangkok, Chulalongkorn University.
- _____. 2004. The outward influence of Chamic into Mon-Khmer speaking areas. *Symposium on New Scholarship on Champa*, Asia Research Institute, National University of Singapore.
- Donaldson, Jean and Dieu Chinh Nhim. 1970. *Tai-Vietnamese-English Dictionary*. [White Tai] Saigon: Bộ Giáo--dục.
- Eberhard, Wolfram. 1968. *The Local Cultures of South and East China*. Leiden: E. J. Brill.
- EFEO. 1938. Questionnaire (207.I-III). École Français d'Extrême-Orient. mss.

- Fei L., Hu S., Ye S., & Huang Y. 2006. *Fauna Sinica (Amphibia I)*. Beijing, China: Science Press.
- Fritz, Uwe; Ong, An Vinh; Pham, Cuong The; Ziegler, Thomas; Farkas, Balázs. 2019. A new species of *Pelodiscus* from northeastern Indochina (Testudines, Trionychidae). *ZooKeys*. 824: 71–86.
- Hashimoto, Mantaro J. 1980. *The Be Language*. Tokyo: Asian and African Lexicon II. Institute for the Study of Languages and Cultures of Asia and Africa.
- Hendrie, Douglas, B., Bùi Đăng Phong, Tim McCormack, Hoàng Văn Hà, Peter Paul van Dijk. 2010. *Các Loài Rùa Cạn và Rùa Nước Ngọt Việt Nam*. (Terrestrial and Freshwater Turtles of Vietnam). Education for Nature Vietnam (ENV).
- Hoàng Văn Ma and Vũ Bá Hùng. 1992. *Tiếng Pu Peo*. Hanoi: Nhà Xuất Bản Khoa Học Xã Hội.
- Hung, Hsiao-chun. 2019. Prosperity and complexity without farming: the South China Coast, c. 5000–3000 BC. *Antiquity* 1-17.
- Jeremiassen, Carl C. 1893. Loi-aborigines of Hainan and their speech. *The China Review, or Notes & Queries on the Far East* 20.5: 296—305.
- Karlgren, Bernhard. 1957. *Grammatica Serica Recensa*. The Museum of Far Eastern Antiquities, Stockholm, Bulletin No. 29.
- Keightly, David. N. 1978. *Sources of Shang History: the Oracel Bone Inscriptions of Bronze Age China*. Berkely: U. of California Press.
- Kitimasak, Wachira, Kumthorn Thirakhupt, Sitdhi Boonyaratpalin, and Don L. Mol. 2005. Distribution and Population Status of the Narrow-Headed Softshell Turtle *Chitra* spp. in Thailand. *The Natural History Journal of Chulalongkorn University* 5.1. 31-42.
- Lafont, Pierre-Bernard. 1968. *Lexique français-jarai-vietnamien; (parler de la Province de Plei Ku)*. (Publications d’Ecole Française d’Extrême-Orient, 63.) Paris: Ecole Française d’Extrême-orient.
- Lê, Minh, Ha Thi Thuy Duong, and Timothy M. McCormack. 2014. A phylogeny of softshell turtles (Testudines: Trionychidae) with reference to the taxonomic status of the critically endangered, giant softshell turtle, *Rafetus swinhoei*. *Organisms Diversity & Evolution*.
- Li, Fang-kuei. 1968. Notes on the T’en or Yanghwang language:glossary. *BIHP* 40.397-504.
- _____. 1977. *A handbook of comparative Tai*. Manoa: University of Hawaii.
- Liu, Z., J. Ma, G. Wei, Q. Liu, Z. Jiang, X. Ding, S. Peng, T. Zeng, and T. Ouyang. 2016. Magnetism of a red soil core derived from basalt, northern Hainan Island, China: Volcanic ash versus pedo-genesis, *Journal of Geophysical Research Solid Earth*, 122, 1677–1696.
- Liu, Ch’eng-chao. 1950. *The Amphibians of Western China*. Fieldiana Zoology Memoirs, Vol. 2. Chicago. Chicago Natural History Museum.
- Long Yaohong and Zheng Guoqiao. 1998. *The Dong Language in Guizhou Province, China*. Dallas: Summer Institute of Linguistics.
- Mathews, Robert H., ed. 1943. *Mathews’ Chinese–English Dictionary*. revised American ed. Harvard University Press.
- Mahidol. 2000. *Kam-Chinese-Thai-English Dictionary*. Bangkok: Mahidol University
- Mahidol. 2003. *Sui-Chinese-Thai-English Dictionary*. Bangkok: Mahidol Univrsity.

- Мазо О. М. Mazo O. M.; Нгуен В. Л. Nguen V. L.; Нгуен Х. Х. Nguen H. H.; and Самарина И. В. Samarina I. V. 2011. Jazyki gèlao: Materialy k сопоставitel'nomu slovarju kadajskih jazykov Языки гэлао: материалы к сопоставительному словарю кадайских языков [*Gelao Languages: Materials for a comparative dictionary of the Kadai languages*]. Moscow: Academia.
- Nguyễn Văn Tài. 2004. Ngữ Âm Tiếng Mường: Qua Các Phương Ngôn. Hà Nội: Nhà Xuất Bản Tư Điển Bách Khoa.
- Norquest, Peter K. 2007. *A Phonological Reconstruction of Proto-Hlai*. Ph.D. Dissertation, University of Arizona.
- Nutphand, Wirot. 1979. *The turtles of Thailand. Siam*. Siam Farm Zoological Garden, Bangkok.
- Ostapirat, Weera 2008. The Hlai Language In *The Tai-Kadai Languages*. Eds. Anthony V.N. Diller and Jerold A. Edmondson. New York and London.
- _____. 2013. The rime system of Proto-Tai. *Bull. Of Chinese Linguistics* 7.1.189-226.
- Pittayaporn, Pittayawat. 2009. *The Phonology of Proto-Tai*. Ph.D. dissertation, Cornell University.
- Principe, Jeark A. 2012. Exploring Climate Change Effects on Watershed Sediment Yield and Land Cover-Based Mitigation Measures Using Swat Model, RS and GIS: Case Of Cagayan River Basin, Philippines. *International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences* 39-B8.193-198.
- Pope, Clifford H. 1935. *The Reptiles of China*. New York: American Museum of Natural History.
- Roux, Henri. 1954. *Quelques Minorités Ethniques du Nord-Indochine*. France-Asie, numéro spécial.
- Savina, F.M. 1910. *Dictionnaire Tay-Annamite-Français*. Hanoi: Imp. D'Extrême-Orient.
- Schafer, Edward. 1962. The eating of turtles in ancient China. *JAOS* 82.73-74.
- _____. 1967. *The Vermilion Bird*. Berkeley: University of California Press.
- Schuessler, Axel. 2007. *ABC Etymological Dictionary of Old Chinese*. Honolulu: University of Hawaii Press.
- Shorto, Harry. 2006. *A Mon-Khmer Comparative Dictionary*. Pacific Linguistics. The Australian National University.
- Stübel, Hans. 1937. *Die Li-Stämme der Insel Hainan*. Berlin : Klinkhardt & Biermann.
- Taylor, Keith W. 1983. *The Birth of Vietnam*. University of California Press, Berkeley.
- Tsuchida, Shigeru. 1976. *Reconstruction of Proto-Tsouic Phonology*. Tokyo: Institute for the Study of Languages and Cultures of Asia and Africa, Tokyo University of Foreign Studies.
- Toizumi, Takeji , Nguyen Kim Thuy, Junmei Sawada. 2011. Fish Remains at Man Bac. In Marc F. Oxenham, Hirofumi Matsumura and Nguyen Kim Dung (eds.), *Man Bac: The Excavation of A Neolithic Site In Northern Vietnam, The Biology*. Australian University Press.
- Turvey, Samuel T., Melissa M. Marr, Ian Barnes, Selina Brace, Benjamin Tapley, Robert W. Murphy, Ermi Zhao, Andrew A. Cunningham. 2019. Historical

- museum collections clarify the evolutionary history of cryptic species radiation in the world's largest amphibians. *Ecology and Evolution*. <https://doi.org/10.1002/ece3.5257>
- UK Naval Intelligence. 1943. *Indo-China*. B.R. 510. Geographical Handbook Series. Naval Intelligence xxz m/nce Division.
- Vickery, Michael. 2005. *Champa Revised*. Asia Research Institute Working Paper Series No, 37. Asia Research Institute, National University of Singapore.
- Wan, Jay Pak-Ho et al. 2015. Conservation Status of Freshwater Turtles in Hainan Island, China: Interviews and Field Surveys at Yinggeling Nature Reserve. *Chelonian Conservation and Biology* 14(1): 100–103.
- Wang Li and Qian Sun. 1951. First steps in the White Sand Li language of Hainan. *Lingnan Science Journal* 2.11: 253-300.
- Wolff, John. 2010. *Proto-Austronesian Phonology with Glossary*. Ithaca: Southeast Asian Program Publications, Cornell University.
- Yang Ping, Tang Yezhong, Ding Li, Yuezhao Wang. 2011. Validity of *Pelodiscus parviformis* (Testudines: Trionychidae) Inferred from Molecular and Morphological Analyses. *Asian Herpetological Research* 2(1):21-29.
- Yap, Fe Aldave. 1973. *A Comparative Study of Philippine Lexicons*. PhD Dissertation, University of Santo-tomas.
- Zhang Shuheng. 2019. Three ancient words for bear. *Sino-Platonic Papers No. 294*. Department of East Asian Languages and Civilizations, University of Pennsylvania.
- Zhengzhang Shangfang. 2003. *Shanggu yinxi*. 《上古音系》 [*Old Chinese Phonology*.] Shanghai: Shanghai Educational Publishing House.