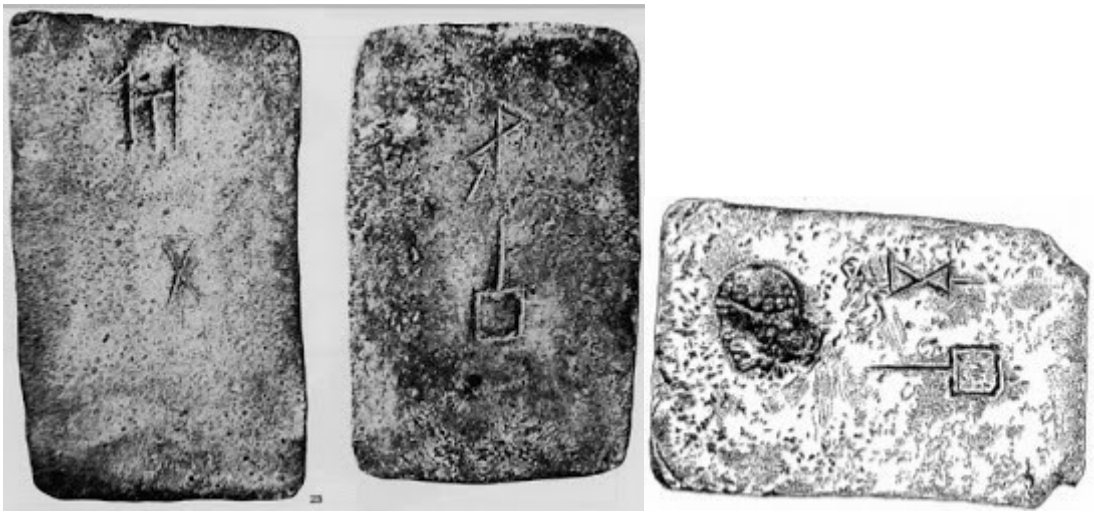
Itihāsa.Tin-Bronze mirror, exemplar of Tin-Bronze Revolution, of Rakhigarhi on an Ancient Maritime Tin Route Meluhha seafaring merchants link Hanoi and Haifa

Evidences for tin provided by archaeometallurgical investigations are exemplars of the Tin-Bronze Revolution which started ca. 5th millennium BCE when the problem of scarcity of arsenical bronzes was oveercome by the invention of a tin-bronze alloy. The tin (cassiterite ore) resource came from the largest Tin belt of the globe in Ancient Far East by the Himalayan rivers grinding down granite rocks to accumulate huge tin ore placer deposits on the Mekong, Irawaddy, Salween river basins. These resources reached through an Ancient Maritime Tin Route to all parts of Eurasia, mediated by Indian metalsmiths and seafaring Meluhha merchant guilds.

This monograph presents archaeometallurgical and maritime trade evidences of ca. 2nd millennium BCE of a wreck of a catamaran in Ayn Sukhna and discovery of three pure tin ingots with Indus Script inscriptions in Haifa, Israel. The Tin-Bronze mirror of Rakhigarhi is significant because the alloy containa about 27% tin. Where did the tin come from?

Link of India with Haifa seen in three tin ingots with Indus Script discovered in a shipwreck in Haifa, ca. 2nd millennium BCE
https://tinyurl.com/ybnqkxtz



The monograph demonstrates the readings and meanings of the epigraphs on the three pure tin ingots:
ranku dhatu muh 'tin mineral ingot'

ranku 'antelope', ranku 'liquid measure' rebus: ranku 'tin'
muh 'face' rebus: muh 'ingot'
dATu 'cross' rebus: dhatu 'mineral.

Videgha Māthava, Gotama Rahugaṇa (ŚBr) করতোয়া নদী Karatoya river is Sadānīra (Amara) and close to the tinbelt of the globe to unleash Tin-Bronze revolution (ca.4th m.BCE)
https://tinyurl.com/y8d4yen4

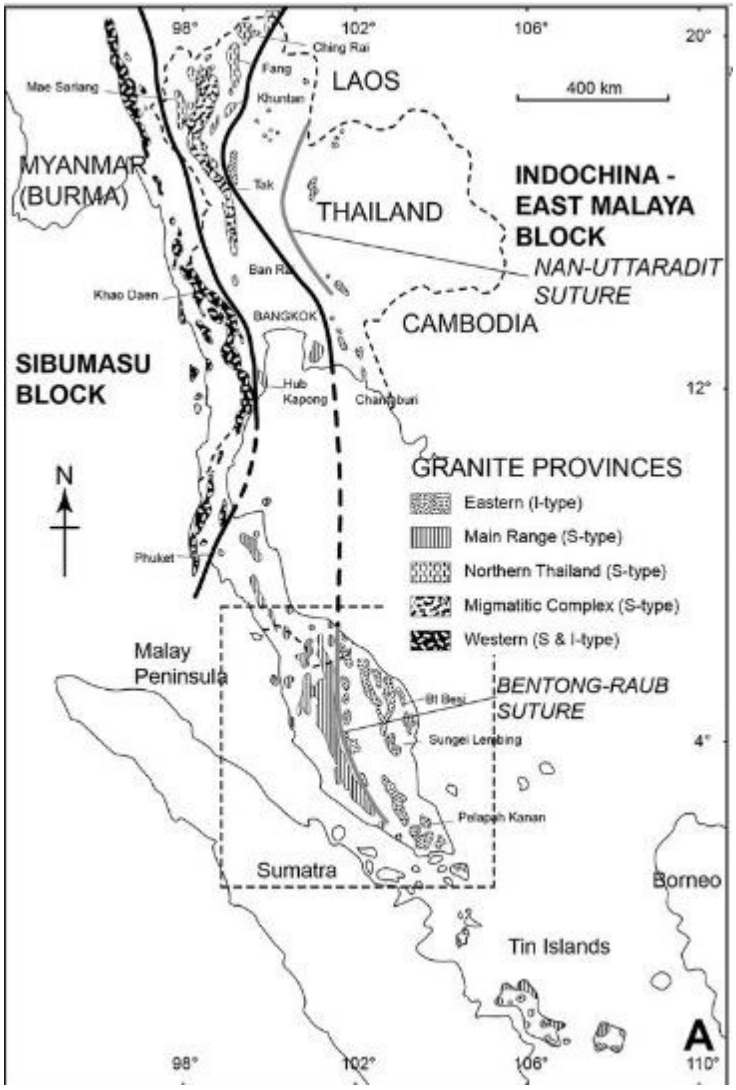
করতোয়া নদী

Amara Kośa asserts Sadānīra to be synonym of Karatoya River.
See: **सदानीरा** स्त्री सदा नीरं पेयमस्याः । करतोयानद्याम् अमरः । "अथादौ कर्कटे देवी त्र्यहं गङ्गा रजस्वला । सर्वा रक्तवहा नद्यः करतोयाम्बुवाहिनी" स्मृत्युक्तेः

> तन्नदीजलस्य सदापेयत्वात् तस्यास्तथात्वम् ।
> Source: https://sa.wikisource.org/wiki/वाचस्पत्यम्

Karatoya Mahatmya refers to the sacredness of this river. Rivers Kosi and Mahananda joined the Karatoya and "formed a sort of ethnic boundary between people living south of it and the Kochs and Kiratas living north of the river." (Majumdar, Dr. R.C., *History of Ancient Bengal*, First published 1971, Reprint 2005, p. 4, Tulshi Prakashani, Kolkata.)

Śatapatha Brāhmaṇa provides a detailed account of the movement of people (Videgha Māthava, Gotama Rahugaṇa) from River Sarasvati to River Sadānīra. The location of this river is central to the history of Pre-Mauryan era *Bhāratam Janam* (RV 3.53.12). The region of these people has been identified in this monograph and relates to the ironwork of the Bronze Age Sarasvati Civilization. It is possible that both Brahmautra and Ganga river systems were waterways which provided for maritime transport of tin ore from the Himalayan riverbasins (Irrawaddy, Salween, Mekong) which contain the richest and largest tin belt of the globe (as the rivers ground down graniterocks to create the cassiterite -- tin ore -- deposit accumulations as placer deposits). Sources of tin were critical to unleash the Tin-Bronze Industrial Revolution of ca. 4th millennium BCE.


98°
102°
106°
20°
12°
4°
110°
Ching Rai
Fang
Khuntan
LAOS
400 km
Mae Sariang
MYANMAR
(BURMA)
Tak
THAILAND
INDOCHINA -
EAST MALAYA
BLOCK
NAN-UTTARADIT
SUTURE
Ban Ri
Khao Daen
BANGKOK
CAMBODIA
SIBUMASU
BLOCK
Hub
Kapong
Chanaburi
N
GRANITE PROVINCES
Eastern (I-type)
Main Range (S-type)
Northern Thailand (S-type)
Migmatitic Complex (S-type)
Western (S & I-type)
Phuket
Malay
Peninsula
BENTONG-RAUB
SUTURE
Bt Besi
Sungei Lembing
Pelapah Kanan
Sumatra
Borneo
Tin Islands
A

"Mâthava, the Videgha, was at that time on the (river) Sarasvatî.

He (Agni) thence went burning along this earth towards the east; and Gotama Râhûgana and the Videgha Mâthava followed after him as he was burning along. He burnt over (dried up) all these rivers.

Now that (river), which is called 'Sadânîrâ,' flows from the northern (Himâlaya) mountain: that one he did not burn over. That one the Brâhmans did not cross in former times, thinking, 'it has not been burnt over by Agni Vaisvânara.'

Now-a-days, however, there are many Brâhmans to the east of it. At that time it (the land east of the Sadânîrâ) was very uncultivated, very marshy, because it had not been tasted by Agni Vaisvânara.

Now-a-days, however, it is very cultivated, for the Brâhmans have caused (Agni) to taste it through sacrifices. Even in late summer that (river), as it were, rages along: so cold is it, not having been burnt over by Agni Vaisvânara.

Mâthava, the Videgha, then said (to Agni), 'Where am I to abide?' 'To the east of this (river) be thy abode!' said he. Even now this (river) forms the boundary of the Kosalas and Videhas; for these are the Mâthavas (or descendants of Mâthava). *(Śatapatha Brāhmaṇa 1.4)*

"Rennel made a survey between 1764 and 1777 and his maps are one of the earliest authentic maps of Bengal in existence. In these maps Teesta is shown as flowing through North Bengal in several branches—Punarbhaba, Atrai, Karatoya etc. All these streams combined lower down with the Mahananda, now the westernmost river in North Bengal, and taking the name of Hoorsagar finally discharged into the Ganges at Jafarganj, near modern Goalundo." https://en.wikipedia.org/wiki/Karatoya_River

Rennel's map (*Bangalir Itihas* by Niharranjan Roy . The map was published in 1764-66.)

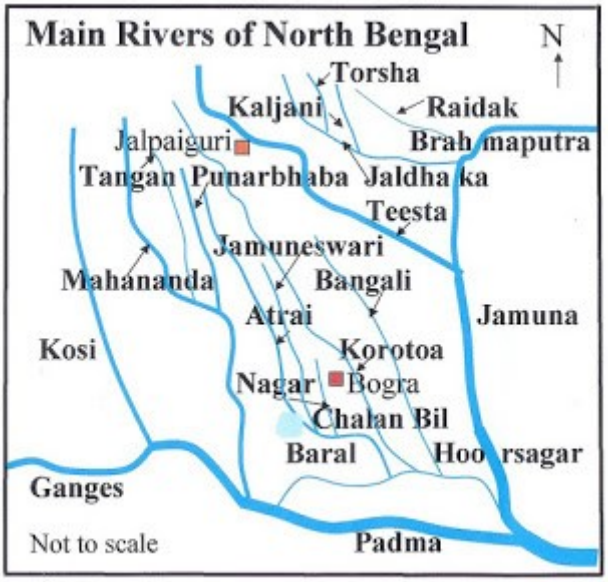
Aitereya Aryanaka of 8th-7th century BC, the Pundra group of people who lived east of the Sadānīra river. *puṇḍra*2 m. ‘ name of a people ’ AitBr., °*aka* -- m. Mn. [Orig. ‘ light -- skinned ’ and same as **puṇḍra** -- 1? Cf. *pāṇḍú* -- , *pāṇḍa* -- ~ *Pāṇḍu* -- , *Pāṇḍa* -- (J. C.W.)]B. *põṛi* ‘ name of a caste ’.(CDIAL 8260)


Karatoya River near Mahasthangarh

Ramparts of the Mahasthangarh citadel

Mahasthangarh Museum, Bogra, Bangladesh
wikipedia.org/wiki/Mahasthangarh

পুন্ড্রবর্ধন with capital city: মহাস্থানগড় *Môhasthangôṛ*



See Bogra on the banks of Karatoya (spelled Korotoa on the map) river. মহাস্থানগড় *Môhasthangôṛ* is close to Bogra.

Rakhigarhi, capital of Sarasvati civilization is on the ridge formed by water-divide of Aravalli range
https://tinyurl.com/ycs496a6

-- on the Ancient Maritime Tin Route through linked navigable Himalayan waterways from Ancient Far East to Ancient Near East.

I suggest proclamation and constitution of two multi-disciplinary project teams involving archaeology, history, language studies, geochemistry, and geology for researches on: 1. Largest tin belt of the globe in AFE and role of seafaring merchants and artisans of India during the Tin-Bronze Revolution; 2. significance of Rakhigarhi as the link between Ancient Far East and Ancient Near East through navigable Himalayan riverine waterways and maritime trade through Indian Ocean Rim.

I suggest that the remarkable work done by Deccan College Archaeology team in the excavations of Rakhigarhi should be expanded further by making the Deccan College a nodel networking agency for the following research missions for two multi-disciplinary projects involving archaeology, history, language studies, geochemistry, and geology:

1. To establish the sources of Tin ores for the Tin-Bronze revolution in Ancient Far East and the role played by ancient Indian seafaring merchants and artisans in reaching the tin ore resource into all parts of Eurasia; and

2. To establish the significance of Himalayan riverwaterys (Mekong, Irrawaddy, Salween, Brahmaputra (karatoya), Ganga, Yamuna, Sarasvati, Sindhu) and links to the Indian Ocean Maritime routes (through Persian Gulf and Malacca straits) to enhance the importance of an Ancient Maritime Tin Route which linked Hanoi (Vietnam) and Haifa (Israel) through ancient India.

There is a distinct indication that the Ancient Maritime Tin Route mediated by Ancient India pre-dated the Silk road by two millennia, authenticated by Indus Script evidence on tin ingots of Haifa and on Dong Son/Karen Bronze drums of AFE.

These two missions are complementary to a remarkable Europe Research Council Project (overview presented below) which is engaged in the resolution of the unsolved problem of sources of tin which created the Tin-Bronze Revolution from 5th millennium BCE. BRONZE AGE TIN is a multidisciplinary project funded by the European Research Council comprising archaeology, history, geochemistry, and geology, conducted by scientists from the University of Heidelberg and the Curt-Engelhorn-Zentrum Archäometrie in Mannheim.which is called a multi-disciplinary initiative called CEZ ARCHAEOMETRIE GGMBH (Visiting address: D6, 3 and C4, 868159 Mannheim, GermanyPhone +49 621 293 8947 Fax +49 621 293 3828) .The objective is to decipher the enigma of the origin of tin in the early bronzes by combining new archeological data and tin isotope ratios. These bronzes appear in a wide area stretching from the Aegean to the Persian Gulf, but this region is geologically devoid of any tin deposits.http://www.cez-archaeometrie.de/?cat=53&lang=en
The location of Rakhigarhi as the capital pattaṇa (riverine port) of Sarasvati Civilization is central to these missions, because Rakhigarhi is location on the ridge of the Aravalli range which constitues the water-divide between 1. west-flowing rivers of Sarasvati (Drishadvati, Chautan), Ghaggar and Sindhu and 2. east-flowing rivers of Yamuna-Ganga-Brahmaputra proximate to other Himalayan river systems of Mekong, Irrawaddy and Salween in Ancient Far East (AFE). These riverine waterways make Rakhigarhi the nodal site which managed resources of tin ores from AFE; copper/zinc ores of Khetri mineral-belt; iron ore resources of Ganga-Brahmaputra basins and progressed archaeometallurgical advances to proclaim a true Metals Age, complementing the domestication of rice, cereals, cotton cultivation and sericulture to make ancient India the richest nation on the globe contributing to 33% of Global GDP by 1 Common Era (pace Angus Madsison)..

These two missions call for a networking ofmultidisciplinary teams to unravel the ancient knowledge systems related to navigation along waterways and the Indian Ocean and metallurgical innovations in alloying and metal casting

(cire perdue etc.) techniques.

This is an addendum to:

1. Videgha Māthava, Gotama Rahugaṇa (ŚBr) করতোয়া নদী Karatoya river is Sadānīra (Amara) and close to the tinbelt of the globe to unleash Tin-Bronze revolution (ca.4th m.BCE)

https://tinyurl.com/y8d4yen4

2. Challenge of matching Indus Script hypertexts & identifying tin isotope fingerprints of Ancient Maritime Tin Route from Hanoi to Haifa https://tinyurl.com/ybg3auhg

Metals Age migrations from Sarasvati river basin of Vedic people Videgha Māthava, Gotama Rāhugaṇa into Ganga (Videha)-Brahmaputra (Karatoya) river basins व्योकाराः 'metalsmiths' https://tinyurl.com/ybe74j3h

করতোয়া নদী

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See: **सदानीरा** स्त्री सदा नीरं पेयमस्याः । करतोयानद्याम् अमरः । "अथादौ कर्कटे देवी त्र्यहं गङ्गा रजस्वला । सर्वा रक्तवहा नद्यः करतोयाम्बुवाहिनी" स्मृत्युक्तेः

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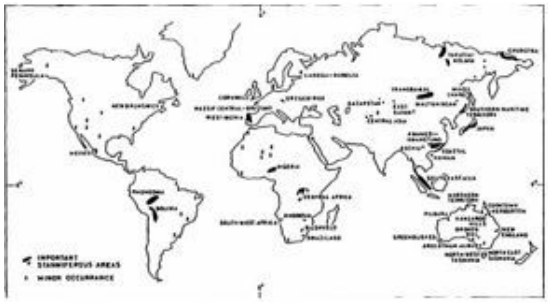
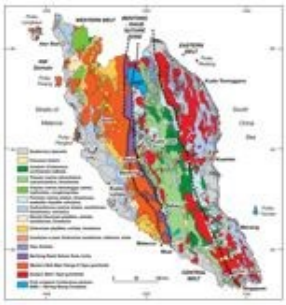
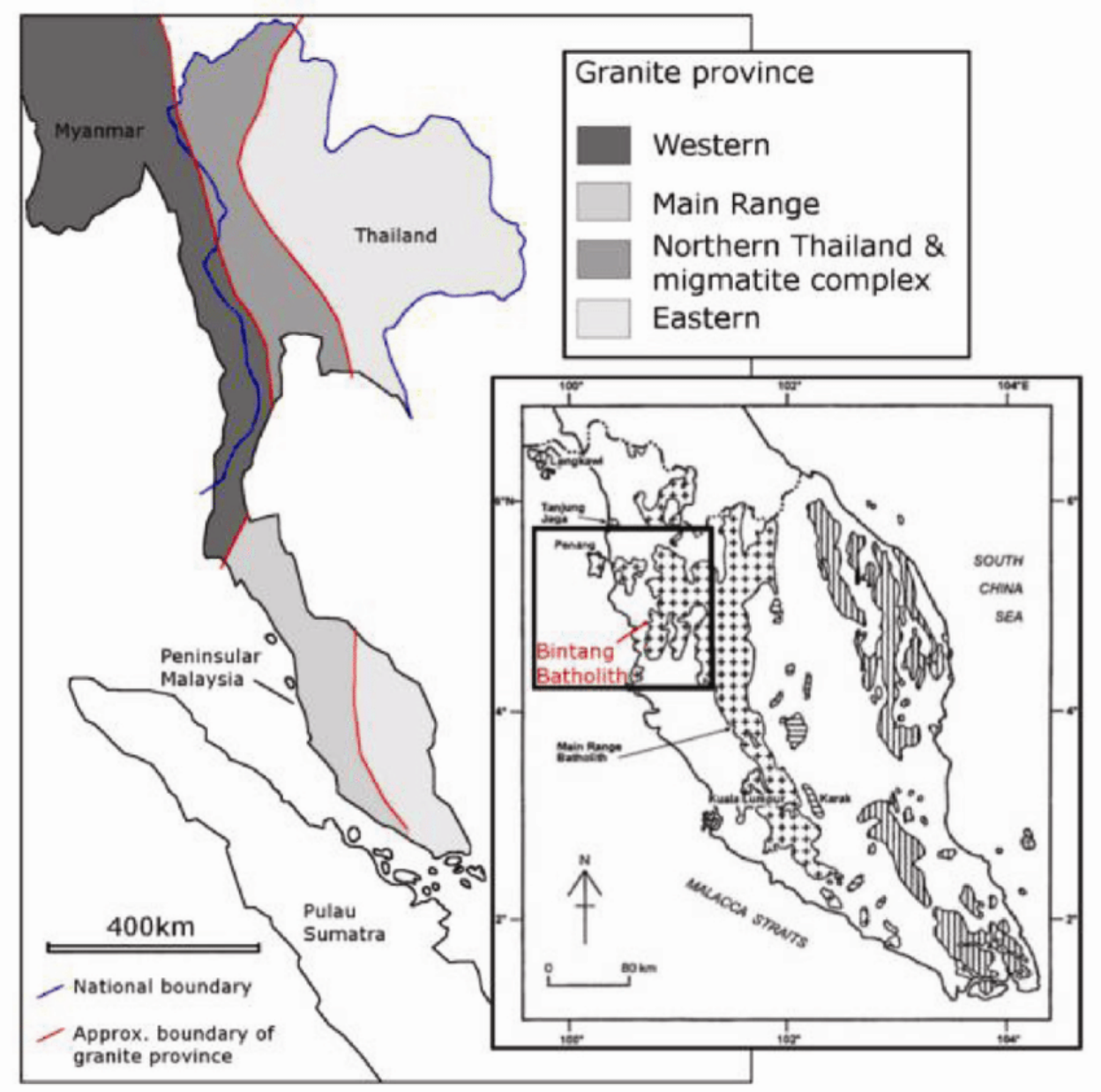
deposit accumulations as placer deposits). Sources of tin were critical to unleash the Tin-Bronze Industrial Revolution of ca. 4th millennium BCE.

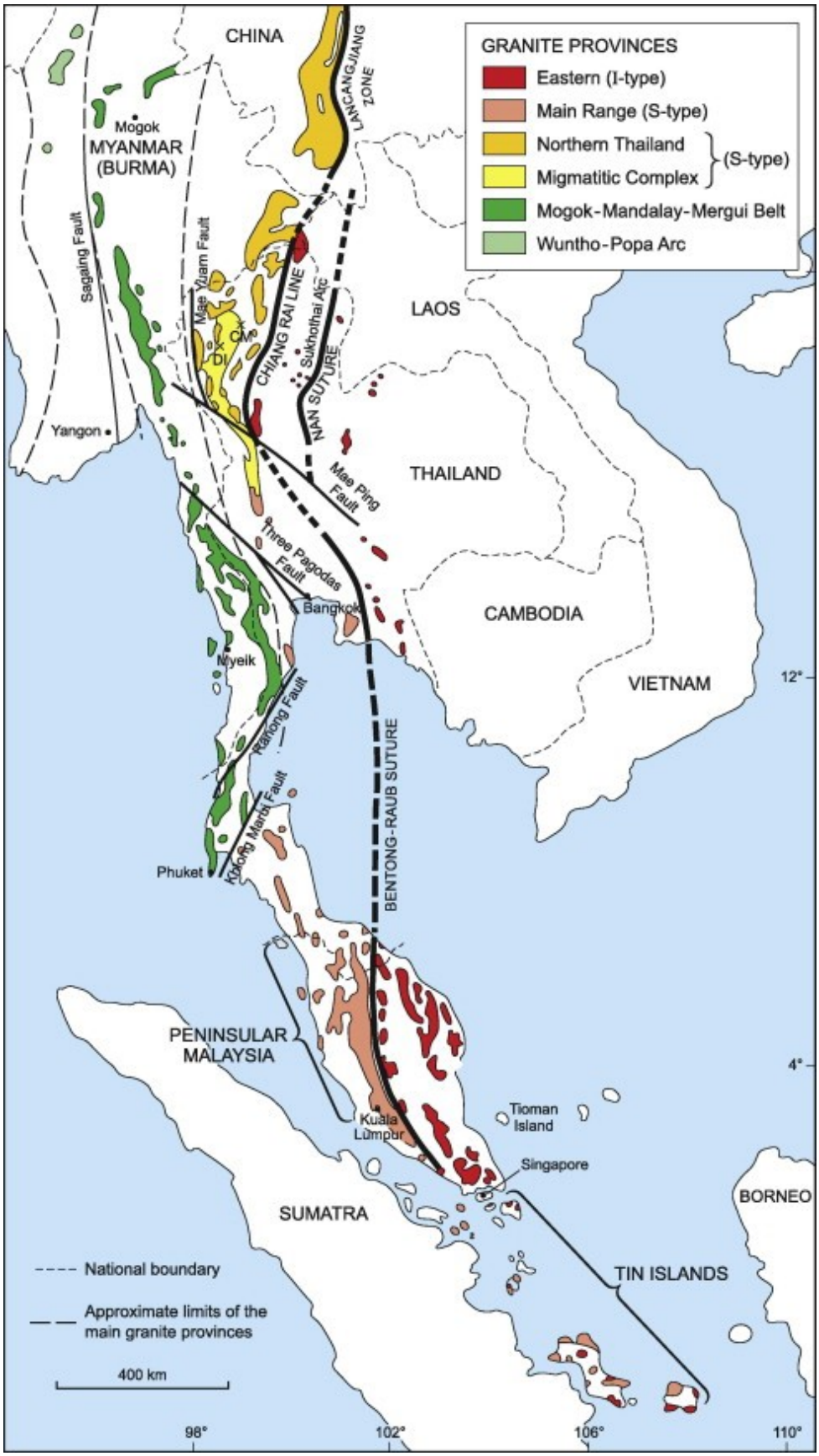
Tin-Bronze Revolution: Largest tin granite belt of the globe (Mekong delta, Malaysia)





In Indonesia, tin is mined on Bangka Island ("Tin Island") off the southeastern coast of Sumatra. Mining pits seen in landscape. Pit tin mine. 1/22/2018


Granite province
Western
Main Range
Northern Thailand & migmatite complex
Eastern
Myanmar
Thailand
Peninsular Malaysia
Pulau Sumatra
400km
National boundary
Approx. boundary of granite province
Bintang Batholith
Main Range Batholith
SOUTH CHINA SEA
MALACCA STRAITS
Penang
Kuala Lumpur
Karak
Langkawi
Tanjung Jaga
N
0
80 km


GRANITE PROVINCES
Eastern (I-type)
Main Range (S-type)
Northern Thailand
Migmatitic Complex
(S-type)
Mogok-Mandalay-Mergui Belt
Wuntho-Popa Arc
CHINA
LANCANGJIANG ZONE
Mogok
MYANMAR (BURMA)
Sagaing Fault
Mae Yuam Fault
CHIANG RAI LINE
Sukhothai Arc
NAN SUTURE
LAOS
Yangon
THAILAND
Mae Ping Fault
Three Pagodas Fault
Bangkok
CAMBODIA
Myeik
VIETNAM
12°
Ranong Fault
Klong Marui Fault
BENTONG-RAUB SUTURE
Phuket
PENINSULAR MALAYSIA
4°
Kuala Lumpur
Tioman Island
Singapore
BORNEO
SUMATRA
TIN ISLANDS
National boundary
Approximate limits of the main granite provinces
400 km
98°
102°
106°
110°

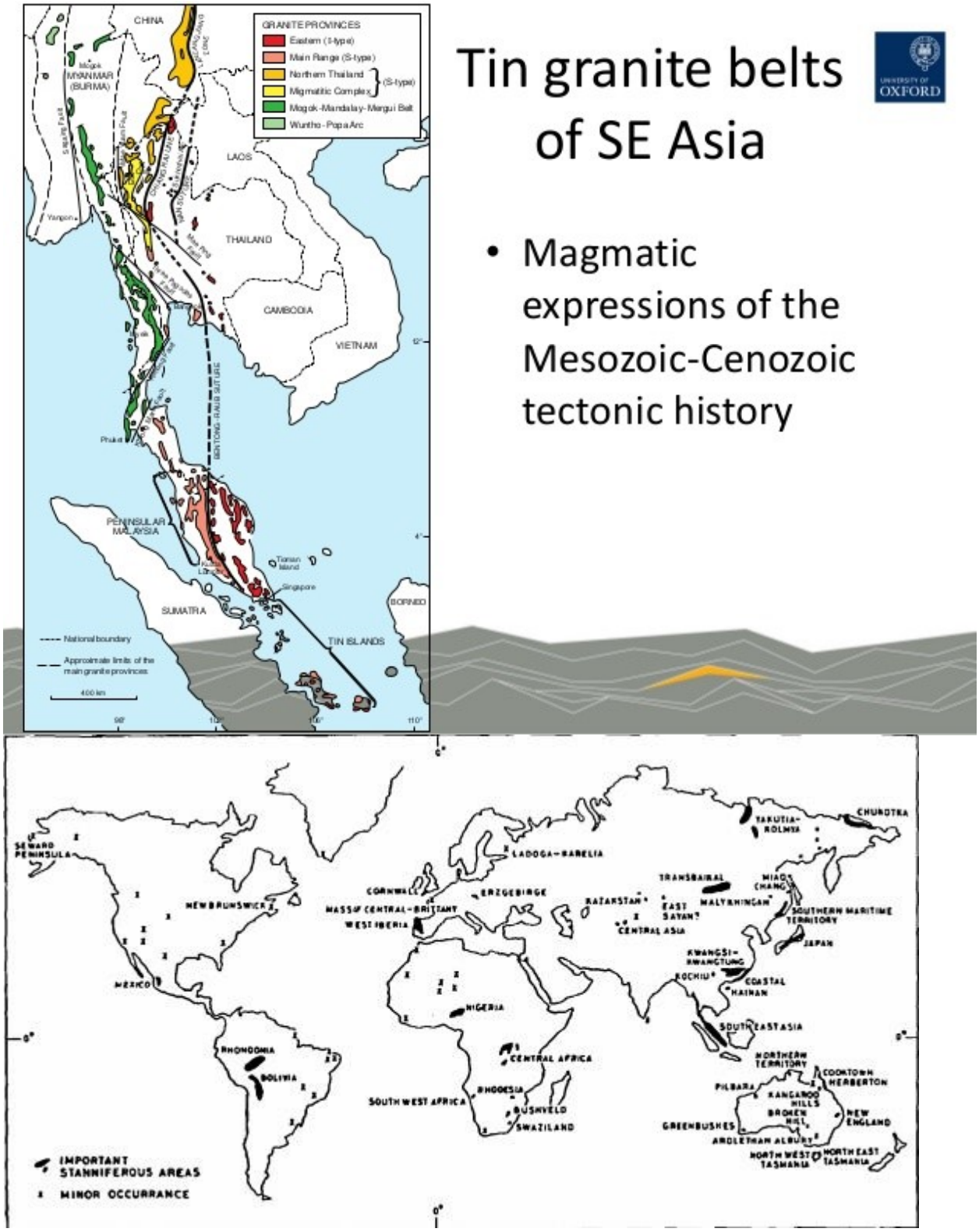
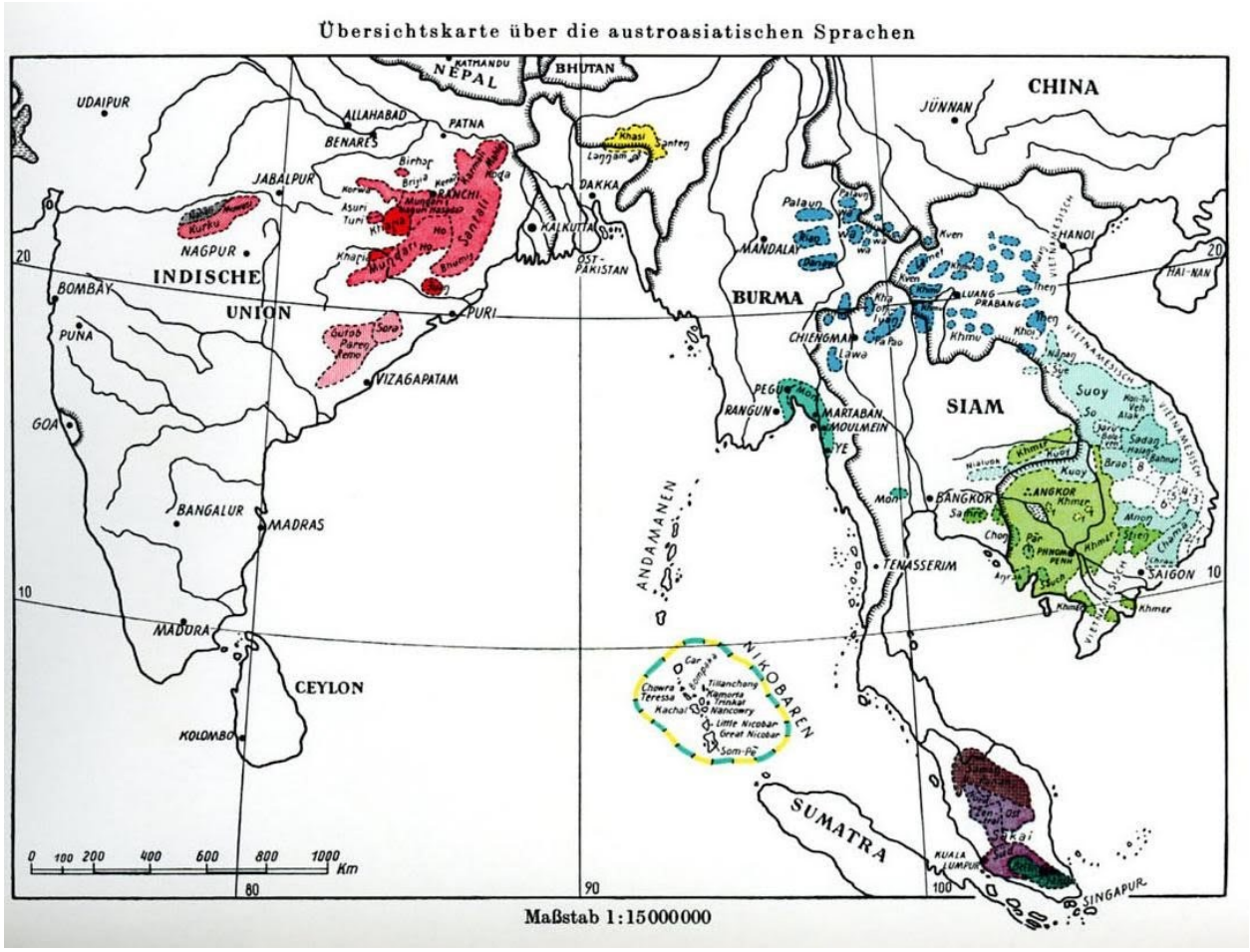
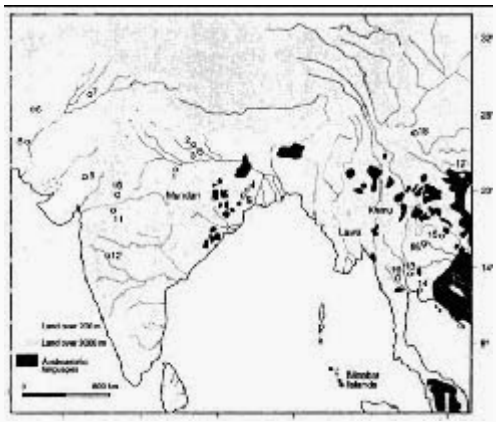


Fig. 8 Largest tin belt of the globe, Ancient Far East

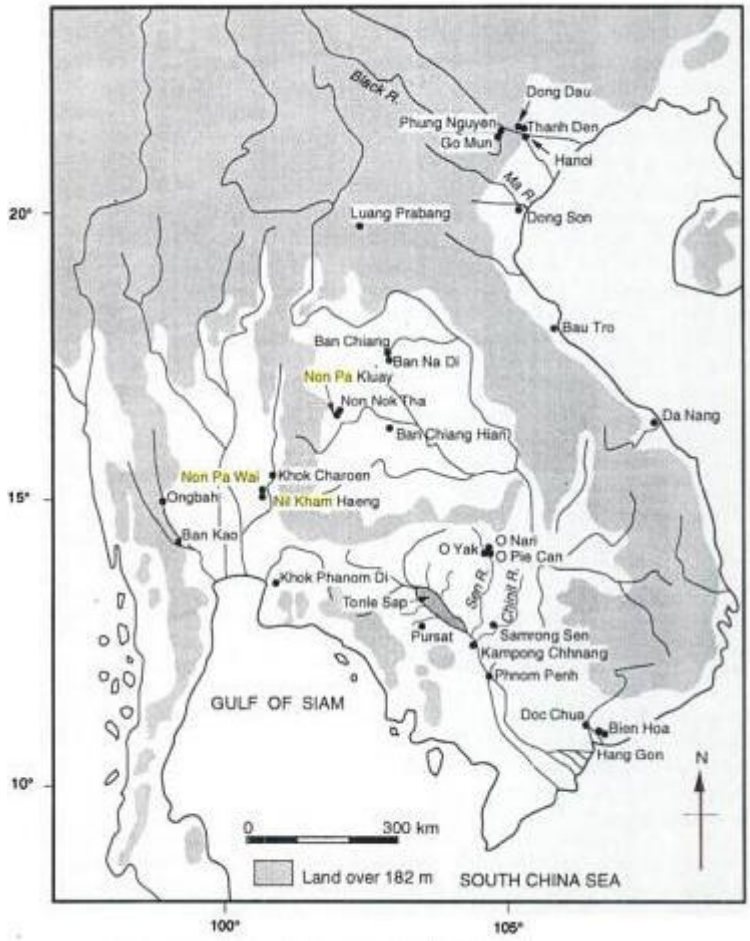


Pinnow-map of Austro-Asiatic language speakers**http://www.ling.hawaii.edu/faculty/stampe/aa.html**



Bronze Age sites of eastern Bha_rata and neighbouring areas: 1. Koldihwa; 2. Khairdih; 3. Chirand; 4. Mahisadal; 5. Pandu Rajar Dhibi; 6. Mehrgarh; 7. Harappa; 8. Mohenjo-daro; 9. Ahar; 10.Kayatha; 11. Navdatoli; 12. Inamgaon; 13. Non Pa Wai; 14. Nong Nor; 15. Ban Na Di and Ban Chiang; 16. Non Nok Tha; 17. Thanh Den; 18. Shizhaishan; 19.

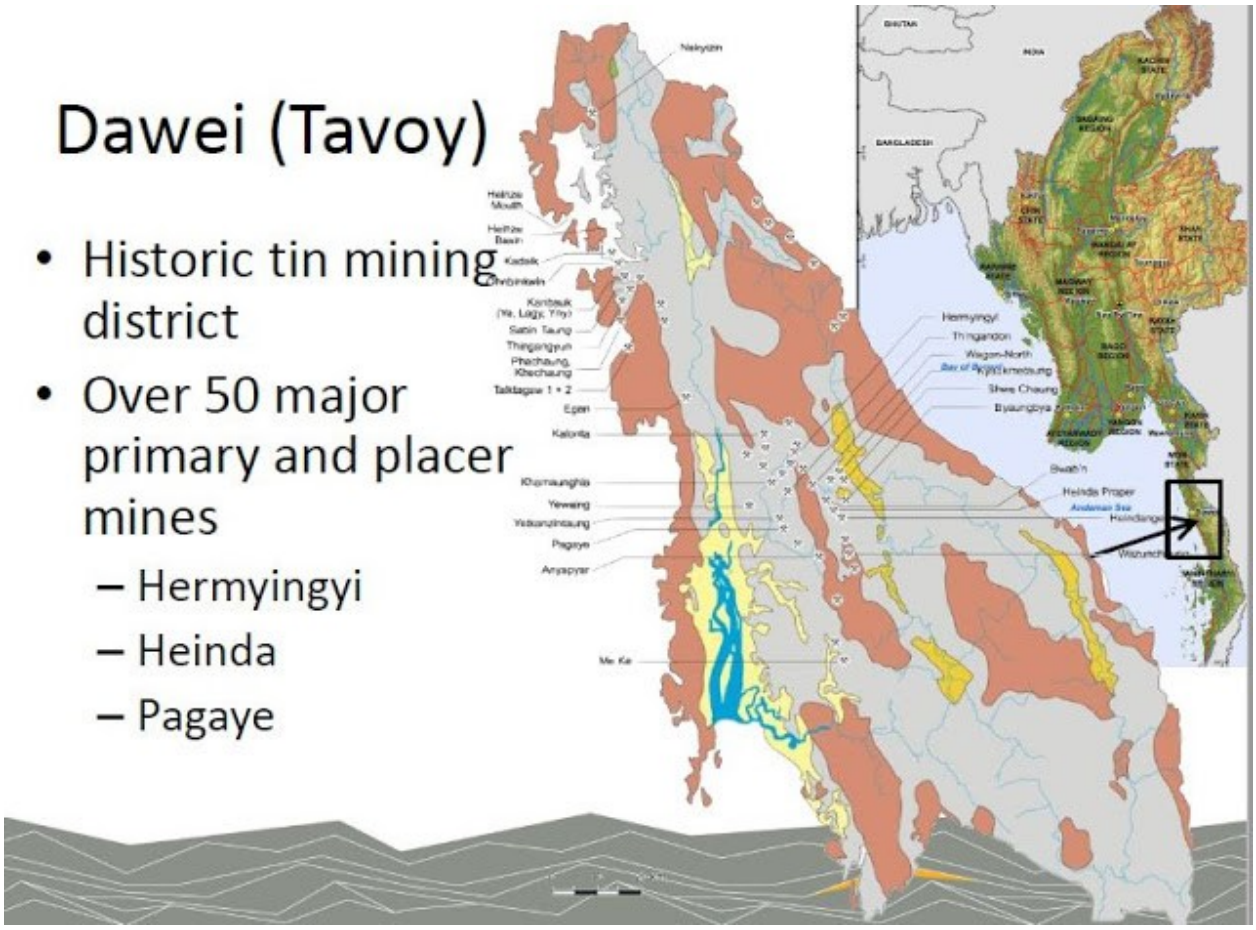
Ban Don Ta Phet [After Fig. 8.1 in: Charles Higham, 1996, *The Bronze Age of Southeast Asia*, Cambridge University Press].

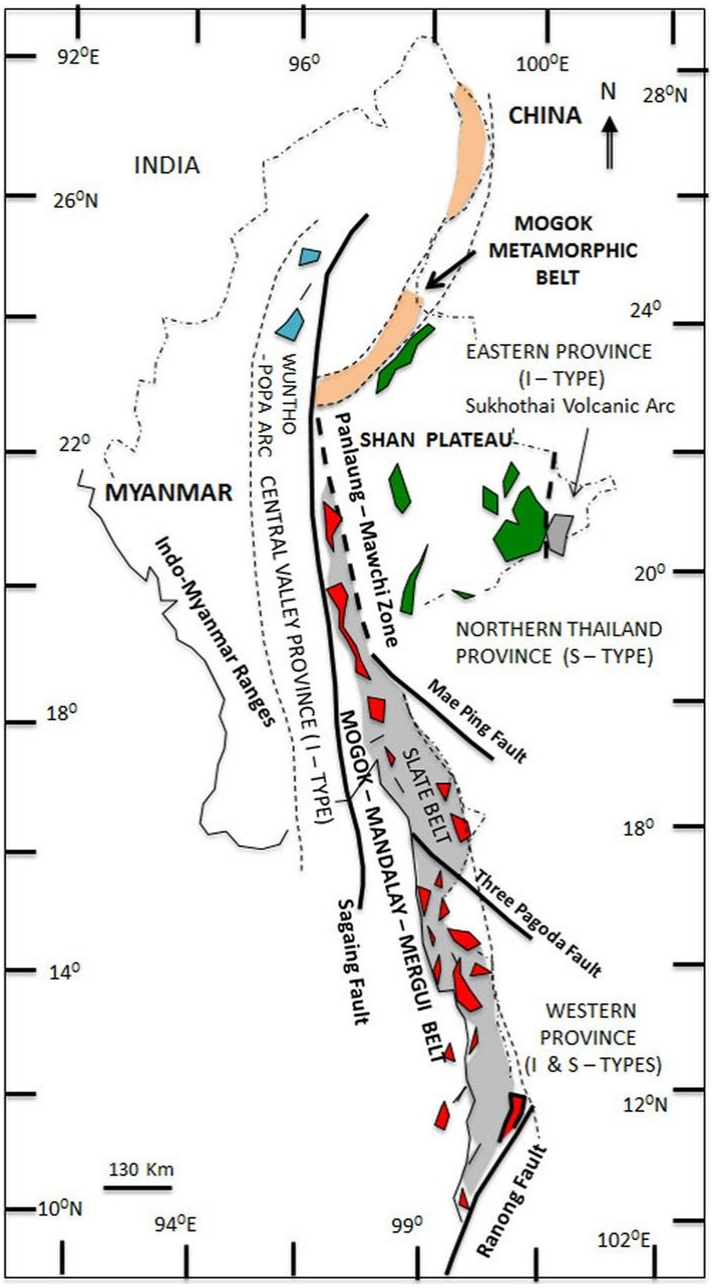


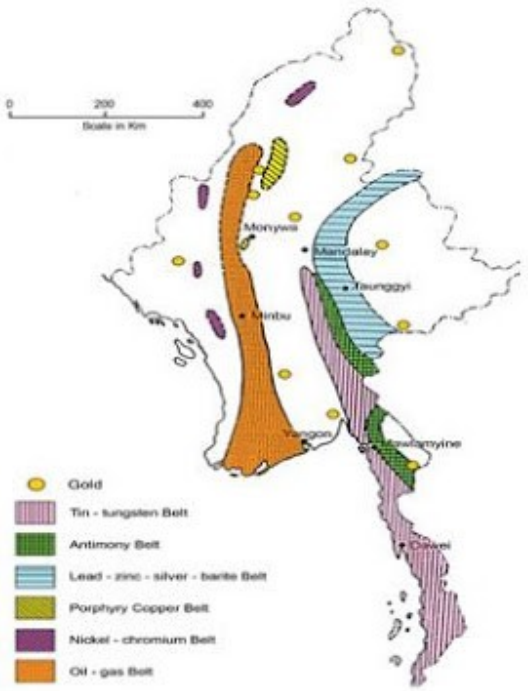
Some Bronze Age sites, Far East. (After Fig. 2.2 in Higham, Charles, 1996, *The bronze age of Southeast Asia*, Cambridge Univ. Press

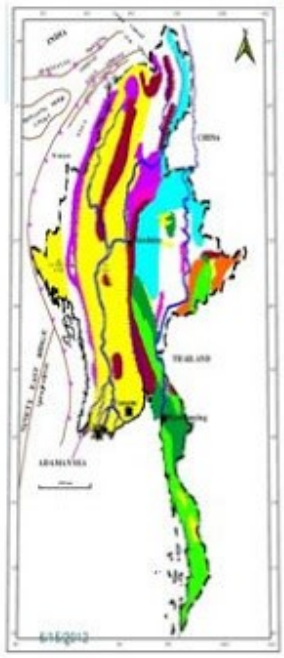
Dawei (Tavoy)

- Historic tin mining district
- Over 50 major primary and placer mines
  - Hermyingyi
  - Heinda
  - Pagaye

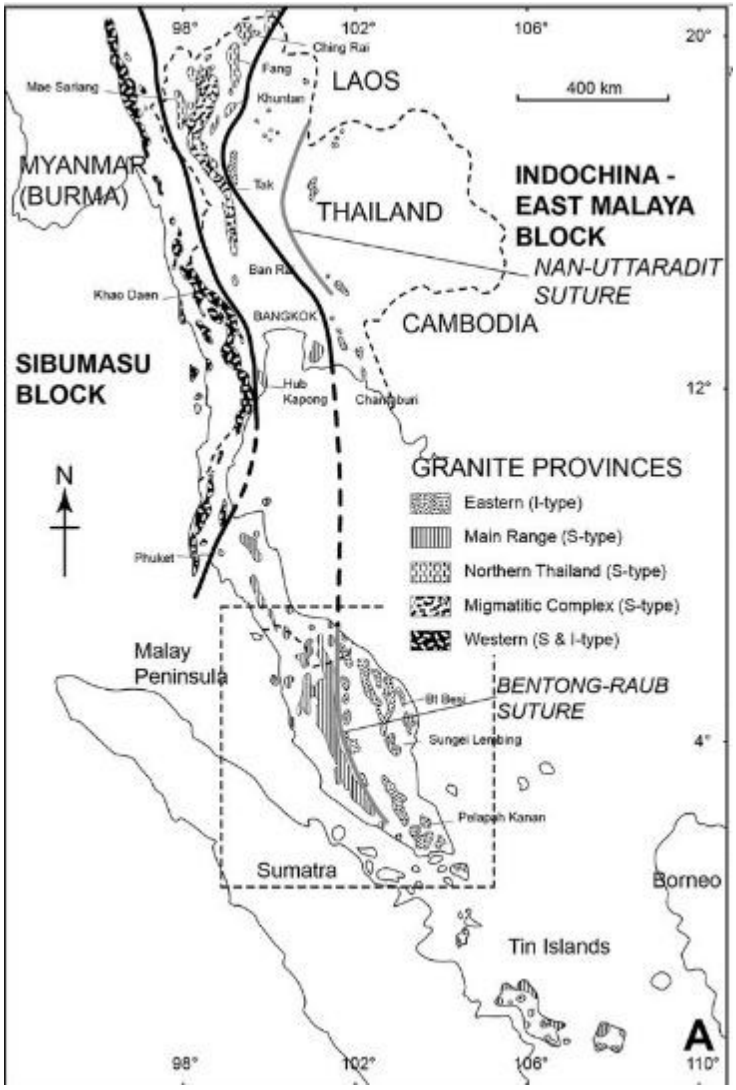



92°E
96°
100°E
N
28°N
CHINA
INDIA
26°N
MOGOK
METAMORPHIC
BELT
24°
EASTERN PROVINCE
(I – TYPE)
Sukhothai Volcanic Arc
WUNTHO
-POPA ARC
CENTRAL VALLEY PROVINCE (I – TYPE)
Panlaung – Mawchi Zone
SHAN PLATEAU
22°
MYANMAR
Indo-Myanmar Ranges
20°
NORTHERN THAILAND
PROVINCE (S – TYPE)
Mae Ping Fault
18°
MOGOK – MANDALAY – MERGUI BELT
SLATE BELT
18°
Three Pagoda Fault
Sagaing Fault
14°
WESTERN
PROVINCE
(I & S – TYPES)
12°N
130 Km
10°N
94°E
99°
Ranong Fault
102°E


0
200
400
Scale in Km
Monywa
Mandalay
Taunggyi
Minbu
Yangon
Dawei
Gold
Tin - tungsten Belt
Antimony Belt
Lead - zinc - silver - barite Belt
Porphyry Copper Belt
Nickel - chromium Belt
Oil - gas Belt




MINERAL BELTS OF MYANMAR
INDEX
Tin- Tungsten Belts
Antimony Belts
Lead – Zinc – Silver- Copper Belts
Gold- Copper- Iron Belts
Nickel- Chromite- Copper- Gold- Platinum Belts
Iron – Manganese Belt
The Precious Stone Belts
Oil- Gas and Coal Belts


98°
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SUTURE
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BANGKOK
CAMBODIA
SIBUMASU
BLOCK
Hub
Kapong
Chanaburi
12°
GRANITE PROVINCES
Eastern (I-type)
Main Range (S-type)
Northern Thailand (S-type)
Migmatitic Complex (S-type)
Western (S & I-type)
N
Phuket
Malay
Peninsula
BENTONG-RAUB
SUTURE
Bt Besi
Sungei Lembing
4°
Pelapah Kanan
Sumatra
Borneo
Tin Islands
A
98°
102°
106°
110°


NEPAL
ASSAM
BURMA
ANDHRA

Rakhigarhi could have linked with iron smelting sites of Yamuna-Ganga Basin and further into Brahmaputra basin through Karatoya mentioned as Sadanira in Rgveda. The name Bogra on Karatoya river is significant. It indicates a site for metalwork: *vyokāra* 'blacksmith'.
Sadānīra is the name of the river mentioned in Śatapatha Brāhmaṇa signifying migrations to Kāśi-Videha by Ayu people from Kurukshetra.

This is the region close to iron ore resources.
Mâthava, the Videgha, was at that time on the (river) Sarasvatî.

He (Agni) thence went burning along this earth towards the east; and Gotama Râhûgana and the Videgha Mâthava followed after him as he was burning along. He burnt over (dried up) all these rivers.

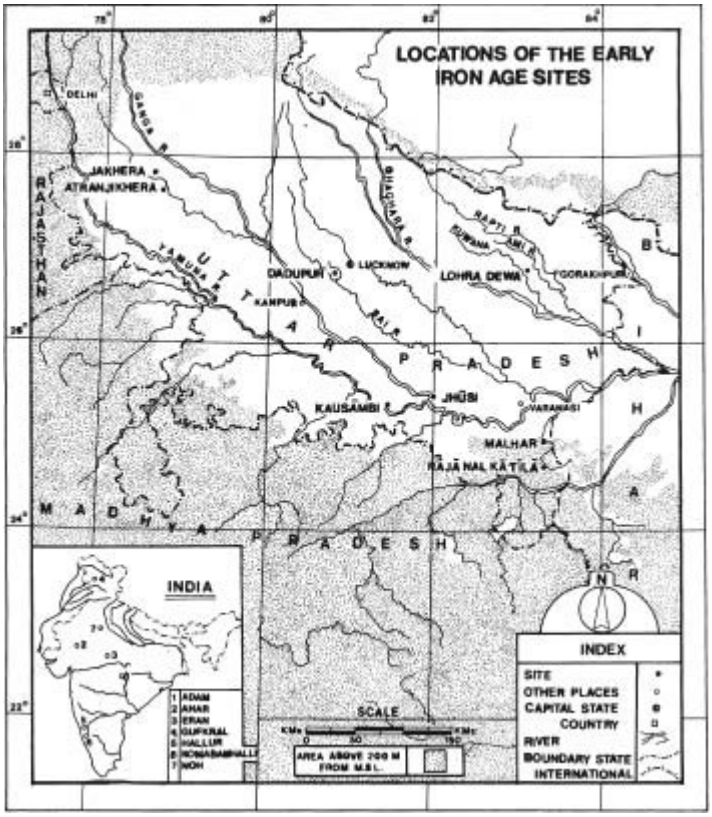
Now that (river), which is called 'Sadânîrâ,' flows from the northern (Himâlaya) mountain: that one he did not burn over. That one the Brâhmans did not cross in former times, thinking, 'it has not been burnt over by Agni Vaisvânara.'

Now-a-days, however, there are many Brâhmans to the east of it. At that time it (the land east of the Sadânîrâ) was very uncultivated, very marshy, because it had not been tasted by Agni Vaisvânara.

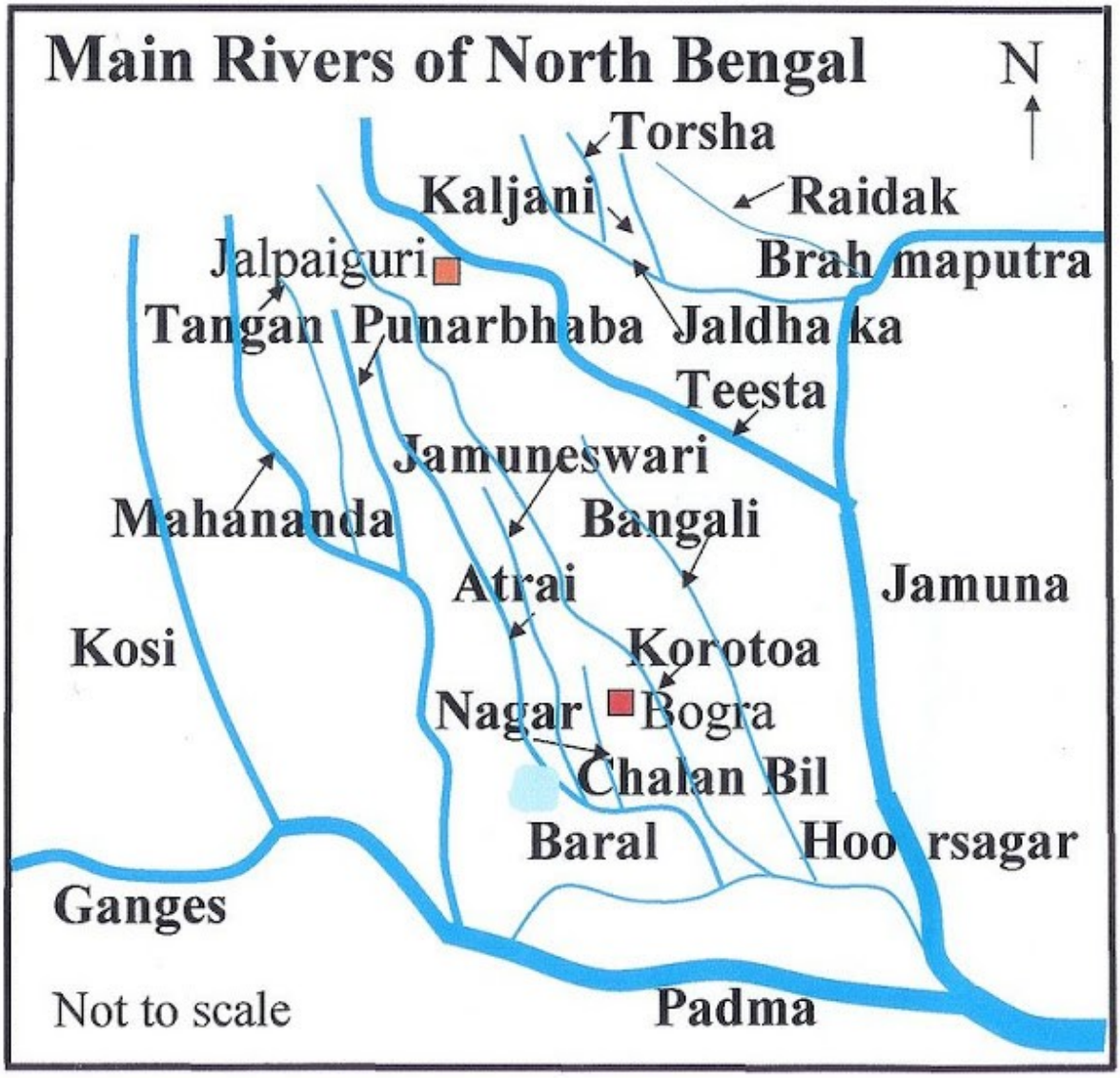
Now-a-days, however, it is very cultivated, for the Brâhmans have caused (Agni) to taste it through sacrifices. Even in late summer that (river), as it were, rages along: so cold is it, not having been burnt over by Agni Vaisvânara.

Mâthava, the Videgha, then said (to Agni), 'Where am I to abide?' 'To the east of this (river) be thy abode!' said he. Even now this (river) forms the boundary of the Kosalas and Videhas; for these are the Mâthavas (or descendants of Mâthava). (Śatapatha Brāhmaṇa 1.4)

I suggest that Sadānīra is Karatoya river. This is the Videha region.See map.Rivers of Bangladesh, August 1997 edition, produced by Graphosman, 55/1 Purana Paltan, Dhaka – 1000, map of Bengal in History of Ancient Bengal, by Dr. R.C. Majumdar,First published 1971, Reprint 2005, p. 4

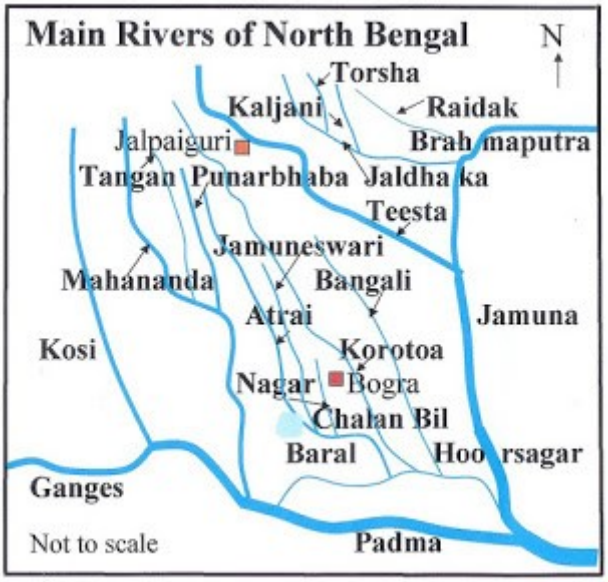


See: http://bharatkalyan97.blogspot.com/2018/04/sadanira-is-karatoya-river-which-joined.html


Main Rivers of North Bengal
N
Torsha
Kaljani
Raidak
Jalpaiguri
Brah maputra
Tangan
Punarbhaba
Jaldha ka
Teesta
Jamuneswari
Mahananda
Bangali
Atrai
Jamuna
Kosi
Korotoa
Nagar
Bogra
Chalan Bil
Baral
Hoo rsagar
Ganges
Not to scale
Padma


Ancient Political Divisions
Gangetic Delta Region
N
Pragjyotisha
Tirabhukti
Harikela?
Kajangala
Kankagrama
Karha
Pundravardhana
Vanga
Harikela?
Samatata
Vangala
Dandabhukti
Not to Scale
Bay of Bengal

পুন্ড্রবর্ধন with capital city: মহাস্থানগড় *Môhasthangôṛ*



See Bogra on the banks of Karatoya (spelled Korotoa on the map) river. মহাস্থানগড় *Môhasthangôṛ* is close to Bogra.

"Mâthava, the Videgha, was at that time on the (river) Sarasvatî.

"Mâthava, the Videgha, was at that time on the (river) Sarasvatî.
He (Agni) thence went burning along this earth towards the east; and Gotama Râhûgana and the Videgha Mâthava followed after him as he was burning along. He burnt over (dried up) all these rivers.

Now that (river), which is called 'Sadânîrâ,' flows from the northern (Himâlaya) mountain: that one he did not burn over. That one the Brâhmans did not cross in former times, thinking, 'it has not been burnt over by Agni Vaisvânara.'

Now-a-days, however, there are many Brâhmans to the east of it. At that time it (the land east of the Sadânîrâ) was very uncultivated, very marshy, because it had not been tasted by Agni Vaisvânara.

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"Rennel made a survey between 1764 and 1777 and his maps are one of the earliest authentic maps of Bengal in existence. In these maps Teesta is shown as flowing through North Bengal in several branches—Punarbhaba, Atrai, Karatoya etc. All these streams combined lower down with the Mahananda, now the westernmost river in North Bengal, and taking the name of Hoorsagar finally discharged into the Ganges at Jafarganj, near modern Goalundo." https://en.wikipedia.org/wiki/Karatoya_River

Rennel's map (*Bangalir Itihas* by Niharranjan Roy . The map was published in 1764-66.)

Aitereya Aryanaka of 8th-7th century BC, the Pundra group of people who lived east of the Sadānīra river. *puṇḍra*2 m. ' name of a people ' AitBr., °*aka* -- m. Mn. [Orig. ' light -- skinned ' and same as **puṇḍra** -- 1?

Cf. *pāṇḍú* -- , *pāṇḍa* -- ~ *Pāṇḍu* -- , *Pāṇḍa* -- (J. C.W.)]B. *pũṛi* ‘ name of a caste ’.(CDIAL 8260)

Karatoya River near Mahasthangarh

Ramparts of the Mahasthangarh citadel

Mahasthangarh Museum, Bogra, Bangladeshwikipedia.org/wiki/Mahasthangarh

Rakhigarhi is the capital pattaṇa (riverine port) linkint east-flowing Himalayan rivers and west-flowing Sarasvati-Sindhu rivers, thus linking Ancient Far East and Ancient Near East beyond Persian Gulf-Tigris-Euphrates doab and Mediterranean Sea. Rakhigarhi may explain how the Ancient Maritime Tin Route from AFE to ANE was managed by seafaring merchants and Meluhha artisans of Sarasvati Civilization to transport the principal resource of Tin ore for the Tin-Bronze Revolution of from 5th millennium BCE. The largest tin belt of the globe is in AFE along the Himalayan river basins of Mekong, Irrawaddy and Salween rivers. This tin belt accounts for nearly 60 % of the world's reserves of cassiterite (tin) ore acumulated by

the action of Himalayan glacial rivers grinding down granite rocks and creating cassiterite placer deposits. The discovery of tin as an alloy of copper to create bronze overcame the scarcity of naturally-occurring Arsenical bronze resources in Eurasia and heralded the Tin-Bronze Revolution.

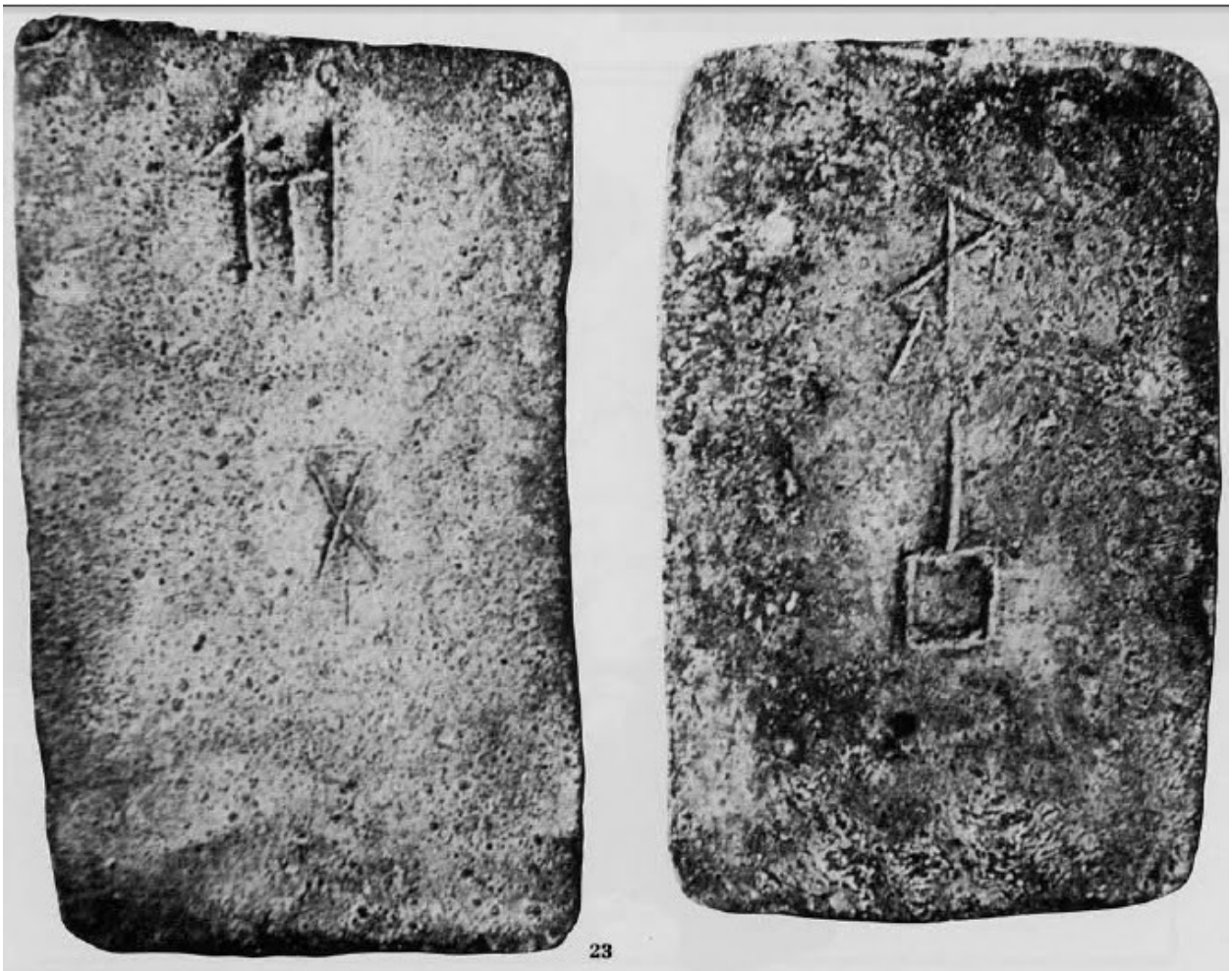
European Research Council Project on sources of tin for Tin-Bronze Revolution

See: Tin isotope fingerprints of ore deposits and ancient bronze -- Briggman et al https://www.academia.edu/35375020/Tin_isotope_fingerprints_of_ore_deposits_and_ancient_bronze I suggest that such tin isotope fingerprints of ore deposits from Mekong, Irrawaddy and Salween Himalayan river valleys should be identified to resolve the problem of sources of tin for the Tin-Bronze revolution from 4th millennium BCE. I suggest this because the largest tin belt of the globe in these river valleys may explain an Ancient Maritime Tin Route from Hanoi to Haifa, which predated Silk Road by 2 millennia.

These studies should invole tin-bvronze artifacts of tin ingots of Haifa shipwreck, Dong Son/Karen Bronze drum tympanums and ANE tin-bronze artifacts. The evidence of over 8000 inscriptions with Indus Script hypertexts including those on the three pure tin ingots of Haifa shipwreck can be matched.

Archaeometallurgical affirmation of the Indus writing cipher

Given the archaeological evidence for oxhide copper and tin ingots, this key argument of rebus readings of Meluhha glosses related to the hieroglyphs is archaeometallurgical reaffirmation of the cipher: Meluhha (aka Santali-Indian*sprachbund*) and use of the writing system on the two pure tin ingots of a shipwreck at Haifa.



23 Tin ingots in the Museum of Ancient Art of the Municipality of Haifa, Israel (left #8251, right #8252). The ingots each bear two inscribed Cypro-Minoan markings. (Note: I have argued that the inscriptions were Meluhha hieroglyphs (Indus writing) denoting ranku 'tin' dhatu 'ore'. See: The Bronze Age Writing System of Sarasvati Hieroglyphics as Evidenced by Two "Rosetta Stones" By S. Kalyanaraman in: *Journal of Indo-Judaic Studies* Volume 1: Number 11 (2010), pp. 47-74.)

ranku 'liquid measure'; *ranku* 'antelope' Rebus: *ranku* 'tin'
(Santali) *dhatu* 'cross' Rebus: *dhatu* 'mineral ore' (Santali).

ran:ku = tin (Santali)

- *ran:ku* = liquid measure (Santali)
- *ran:ku* a species of deer; *ran:kuka* (Skt.)(CDIAL 10559).
- *dāṭu* = cross (Te.); dhatu = mineral (Santali)
- Hindi. *dhāṭnā* 'to send out, pour out, cast (metal)' (CDIAL 6771).

These two hieroglyphs were inscribed on two tin ingots discovered in port of Dor south of Haifa from an ancient shipwreck. They are allographs. Both are read in Meluhha (Mleccha) of Indian *sprachbund*: *ranku* 'liquid measure'; *ranku* 'antelope'.Rebus: *ranku* 'tin'. An allograph to denote tin is: tagara 'ram' Rebus: tagara 'tin'. Rebus: damgar 'merchant' (Akkadian) tagara 'ram' Rebus: tagaram 'tin'. Ta. takar sheep, ram, goat, male of certain other animals (yāḷi, elephant, shark). பொருநகர் தாக்கற்குப் பேருந் தகைத்து (குறள், 486).Ma. takaran huge, powerful as a man, bear, etc. Ka. tagar, ṭagaru, ṭagara, ṭegaru ram. Tu. tagaru, ṭagarů id. Te. tagaramu, tagaru id. / Cf. Mar. tagar id. (DEDR 3000). Rebus 1: tagromi 'tin, metal alloy' (Kuwi) takaram tin, white lead, metal sheet, coated with tin (Ta.); tin, tinned iron plate (Ma.); tagarm tin (Ko.); tagara, tamara, tavara id. (Ka.) tamaru, tamara, tavara id. (Ta.): tagaramu, tamaramu, tavaramu id. (Te.); ṭagromi tin metal, alloy (Kuwi); tamara id. (Skt.)(DEDR 3001). trapu tin (AV.); tipu (Pali); tau, taua lead (Pkt.); *tū̃* tin (P.); ṭau zinc, pewter (Or.); tarūaum lead (OG.); *tarvũ* (G.); tumba lead (Si.)(CDIAL 5992). Rebus 2: damgar 'merchant'.

tagaraka *tabernae montana* (Skt.) Rebus: tagara 'tin' (Ka.)

ranku 'antelope'Rebus: ranku = tin (santali)
tagara 'ram' Rebus: tagaram 'tin'.
ranku 'liquid measure'. Rebus: ranku 'tin' (Cassiterite) (Santali) *ranga* = tin (Kur.)

Another tin ingot with comparable Indus writing was reported by Artzy:

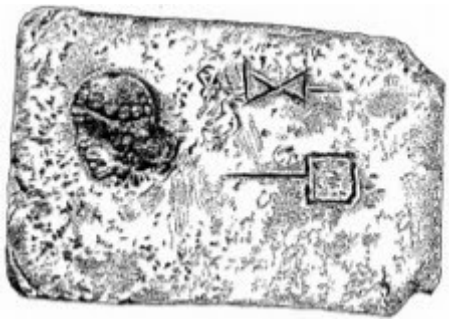


Fig. 4 Inscribed tin ingot with a moulded head, from Haifa (Artzy, 1983: 53). (Michal Artzy, 1983, Arethusa of the Tin Ingot, Bulletin of the American Schools of Oriental Research, BASOR 250, pp. 51-55) https://www.academia.edu/5476188/Artzy-1983-Tin-Ignot

The two hieroglyphs incised which compare with the two pure tin ingots discovered from a shipwreck in Haifa, the moulded head can be explained also as a Meluhha hieroglyph without assuming it to be the face of goddess Arethusa in Greek tradition: Hieroglyph: mũhe 'face' (Santali) Rebus: mũh

‘ingot’ (Santali). The three hieroglyphs are: ranku 'antelope' Rebus: ranku 'tin' (Santali) ranku 'liquid measure' Rebus: ranku 'tin' (Santali). *dāṭu* = cross (Te.); dhatu = mineral (Santali) Hindi. *dhāṭnā* ‘to send out, pour out, cast (metal)’ (CDIAL 6771). [The 'cross' or X hieroglyph is incised on both ingots.]

Source: http://bharatkalyan97.blogspot.in/2015/02/ancient-history-of-bharatam-janam-along.html

The entire Indus script copora stands validated as metalwork catalogs of Meluhha artisans/traders on the Tin Road from Hanoi to Haifa, underscoring the role played by the world’s largest Tin belt of the Far East in the revolution of the Bronze Age in Ancient Near East (also Eurasia).

Tin-Bronze Age Revolution on Maritime Tin Route from Hanoi to Haifa & matching revolution of Indus Script writing system

Mirror: http://tinyurl.com/zz5fo2p

The addition of tin to copper to create bronze alloy was a revolution. The tin-bronze replaed arsenical bronze (copper + arsenic) which was a natural source and in short supply.

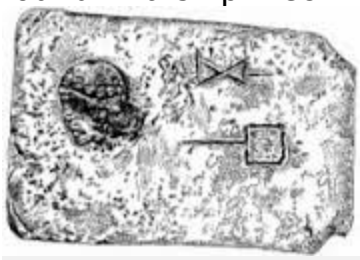
This Tin-Bronze Revolution is matched by the revolution of a writing system called Indus Script to document ancient India's contributions to metalwork.

As yet an unresolved mystery related to the Tin-Bronze Age Revolution is the source of tin.

I have suggested a hypothesis that 1. the supply of tin was along an Ancient Maritime Tin Route from the Tin Belt of the Globe which is in the Mekong River delta in the Far East with merchants of Ancient India acting as intermediary seafaring merchants reaching tin upto Haifa, Israel and 2. the approximate date for seafaring merchants on this Tin Route is about 2 millennia prior to the famed Silk Route.

Map showing the location of known tin deposits exploited during ancient times

This hypothesis is premised on two areas of evidence: 1. Dong Son bronze drums of Vietnam and 2. Three pure tin ingots with Indus Script hieroglyphs found in a shipwreck in Haifa.



Inscribed tin ingot with a moulded head, from Haifa (Artzy, 1983: 53). (Michal Artzy, 1983, Arethusa of the Tin Ingot, Bulletin of the American Schools of Oriental Research, BASOR 250, pp. 51-55) https://www.academia.edu/5476188/Artzy-1983-Tin-Ignot
Tin ingots in the Museum of Ancient Art of the Municipality of Haifa, Israel (left #8251, right #8252). The ingots each bear two inscribed Cypro-Minoan markings. (Note: I have argued that the inscriptions were Meluhha hieroglyphs (Indus writing) denoting ranku 'tin' dhatu 'ore'. See: The Bronze

Age Writing System of Sarasvati Hieroglyphics as Evidenced by Two "Rosetta Stones" By S. Kalyanaraman in: *Journal of Indo-Judaic Studies* Volume 1: Number 11 (2010), pp. 47-74.)

"Non Nok Tha and Ban Chiang have shown a flourishing bronzeworking tradition which may predate the mid-fourth millennium B.C. The earliest analysed find from Ban Chiang—a dagger which dates to about 3600 B.C.-contains 2.5% tin (determined by atomic absorption spectroscopy), a figure which indicates a deliberate alloy. By 3000 B.C., ancient metalsmiths in Thailand were producing good bronze with about a 10% tin content and were competently handling casting, coldworking and annealing. The early production of bronze in Thailand may eventually be found to have some relationship with the development of alloying techniques in the Near East." http://www.penn.museum/sites/expedition/tin-in-the-ancient-near-east/ Tin in the Ancient Near East Old Questions and New Finds By: *Robert Maddin* and *Tamara Stech Wheeler* and *James D. Muhly Expedition, Winter 1997*

About the finds of two tin ingots in a Haifa shipwreck, R. Maddin, T. Wheeler and JD Muhly noted: "…it is probable that, both metals necessary in the making of bronze, were distributed by an administrative complex centred on Cyprus. Although the source of the tin is unknown, it passed through Cyprus where it received the markings, which are also found on some copper ingots of LBA date." (Maddin et al, 1977: 46). While the markings may have been made in Cyprus, the script hieroglyphs incised on the two ingots are Meluhha hieroglyphs commonly found in Indus Script corpora. "A few years later, Artzy (1983:52) published two more ingots, which were found in a car workshop in Haifa, where they were being used for soldering broken radiators. The new ingots were not only identical in size and shape with the previous two, but they were also engraved with two marks. In fact, one of the ingots had identical marks to one of the earlier discovered ones (Artzy, 1983: 52). The four ingots, therefore, were rightly identified as belonging to the same group or cargo of a ship. There was one difference, however, and that was the presence of a moulded head on one of the two ingots, which clearly had been produced when the ingot was cast (Fig.4). On stylistic grounds Artzy (1983: 52) dated the figure to the fifth century BCE and identified her as Arethusa, a fountain goddess who appears on Syracusan coins of this period. She then proceeded to search for the engraved symbols on syllabaries of the fifth century BCE which led her to suggest that the symbols may in fact be Iberian (Artzy, 1983:53). She, therefore, cautiously suggested that the ingots might have been produced in Iberia, sometime in the first quartr of the 5th century BCE (Artzy, 1983:54). I have not located any pubished reactions to this proposition, which refuted both the Late Bronze Age date of the tin ingots, and the allocation of the marks to the

Cypro-Minoan script." (Vasiliki Kassianidou, The trade of tin and the island of copper, in: Alessandra Giumlia-Mair, Fulvia Lo Schiavo (eds.), *The problem of early tin*, BAR International Series 1199, 2003, pp. 112-113).https://www.academia.edu/4038201/The_trade_of_tin_and_the_island_of_copper

Decipherment of Indus Script on Haifa tin ingots

The two hieroglyphs incised which compare with the two pure tin ingots discovered from a shipwreck in Haifa, the moulded head can be explained also as a Meluhha hieroglyph without assuming it to be the face of goddess Arethusa in Greek tradition: Hieroglyph: mũhe 'face' (Santali) Rebus: mũh 'ingot' (Santali). The three hieroglyphs are: ranku 'antelope' Rebus: ranku 'tin' (Santali) ranku 'liquid measure' Rebus: ranku 'tin' (Santali). *dāṭu* = cross (Te.); dhatu = mineral (Santali) Hindi. *dhāṭnā* 'to send out, pour out, cast (metal)' (CDIAL 6771). [The 'cross' or X hieroglyph is incised on both ingots.]

Evaluating this Herodotus text to determine the sources of tin in Athens, James D. Muhly notes: "...it is nonetheless unlikely that we shall ever have exact knowledge about the sources of the tin being used to supply Minoan Crete or Mycenaean Greece...Of greater relevance is the revival of the concept of metallogenic provinces and the formation of metallic belts -- copper belts, lead-zinc belts and tin-tungsten belts -- extending over wide areas, as part of the on-going research on plate tectonics and theories of continental drift. What this means for the archaeologist is that mineral deposition is unlikely to have taken place in random, isolated deposits and that theories positing the existence of such deposits are to be regarded with great skepticism. Most important of all is the absolute geological principle that tin is to be found only in association with granite rock. The concentration of tin varies within any single granite formation and among different formations, depending upon local conditions and geological heritage, but without granite there is no possibility of tin ever having been present. Therefore, large areas of the world are automatically ruled out as possible sources of tin. The island of Cyprus is one of these areas; since there is no granite there, it never could have contained deposits of tin...Tin is commonly present in association with pegmatites of quartz and feldspar. Like gold, the tin is found within veins of quartz running through the granite rock. The difference is that while gold occurs as a native metal, tin appears in the form of an oxide (SnO_2) known as cassiterite. This cassiterite, again like gold, was frequently exposed and freed from its host through weathering and degradation of the quartz and granite. This degradation was often the result of action by water, the cassiterite (and gold) thus taking the form of small lumps or nuggets present in the stream bed. Although carried

along by the force of the current, the cassiterite (and gold), having a specific gravity because of its density, tends to sink and concentrate in the bed of the streams. In general, concentration increases with proximity to the original deposit of the tin...This stream or alluvial tin was thus to be found in the form of small black nuggets of cassiterite known as tin-stone. Recovery involved the panning of the gravel in the stream bed, separating out the cassiterite from the worthless sand and gravel. The process was similar to that which must have also been used to recover gold, and what was done in antiquity was probably not that different from the techniques -- and even the equipment -- used by the Forty-Niners in the great Gold Rush in California and Alaska during the mid-nineteenth century. While gold was recovered as a native metal, the tin was to be found in the form of an oxide that had to be smelted together with charcoal in order to free the oxygen and reduce the oxide to metallic tin...Words for tin...are known in Sumerian, Akkadian, Hittite, Egyptian and Ugaritic, although not in Mycenaean Greek...Sumerian AN.NA, Akkadian *annaku* mean tin and all Assyriologists are in agreement on this point...Mesopotamian texts...describe the addition of AN.NA/*annaku* to URUDU/*eru* in order to produce ZABAR/*siparru*or, in other words, of tin to copper in order to make bronze...twenty-sixth century BCE...Tin appears in the Royal Cemetery, as at Ebla, together with gold and lapis lazuli. All three materials are to be found in Afghanistan, and it is quite possible that they did all come to Mesopotamia (and to northern Syria) via an orland route across Iran...There is as yet, no hard evidence that Sumerian tin came from Afghanistan, but such a source has long been suggested on the basis of textual and archaeological evidence-- a sugestion that up to now could only be regarded as but an interesting hypothesis because of the lack of geological evidence for the existence of tin deposits in Afghanistan...east-west movement of tin is documented in the numerous Old Assyrian texts from Kultepe, the ancient *karum* Kanish. Again from unspecified sources to the east, the tin was brought to Assur and from there shipped overland by donkey caravan to various Assyrian merchant colonies in Anatolia...(Afghanistan's) deposits of gold and lapis lazuli, both materials highly prized by the Sumerians during the third millennium BCE, may have led ancient prospectors to tin, which was also then exported to Sumer. It is even possible that, via Mari and Ugarit, Afghan tin was carried to Middle Minoan Crete, the land of Kaptaru..." (Muhly, James D., Sources of tin and the beginnings of bronze metallurgy, in: *American Journal of Archaeology*, 89 (1985), pp. 277-283, 290).

- Serge Cleuziou and Thierry Berthoud made a convincing case in May 1982 for identifying the sources of tin in the Near East. Their search extended upto Afghanistan and 'the land of Meluhha'.

" In the later 4th and early 3rd millennia, greater tin values occur-5.3% in a pin from Susa B; and 5% in an axe from Mundigak III, in Afghanistan; but these are still exceptional in a period characterized by the use of arsenical copper. It is only around 2700 B.C., during Early Dynastic III in Mesopotamia, that both the number of bronze artifacts and their general tin content increase significantly. Eight metal artifacts of forty-eight in the celebrated "vase a la cachette" of Susa D are bronzes; four of them—three vases and one axe—have over 7% tin. The analyses of objects from the Royal Cemetery at Ur present an even clearer picture: of twenty-four artifacts in the Iraq Museum subjected to analysis, eight containing significant quantities of tin and five with over 8% tin can be considered true bronzes in the traditional sense...We know that the tin came from the east, but from where? Mentions in ancient texts are rare, and only one of them, dating to the time of Gudea of Lagash (2150-2111 B.C.], speaks of the tin of Meluhha. Meluhha is one of the lands east of Mesopotamia, along with Dilmun (Bahrain) and Makkan (the peninsula of Oman). Its location is still controversial, but most scholars tend to place it in Afghanistan or Pakistan. The lists of goods imported to Mesopotamia from Meluhha point to the Indus Valley and the Harappan civilization, but it is not always easy to make a distinction between those which originated in Meluhha and those which passed through Meluhha...A long-distance trade in tin is of course hypothetical...If we now turn to the "land of Meluhha," or at least to the vast area of which parts have been identified with Meluhha, the use of tin is attested already in the late 4th or early 3rd millennium at Mundigak III in southern Afghanistan. Tin appears only in small quanities in artifacts from Shahr-i Sokhta in eastern Iran and at Tepe Yahya in southern Iran (among the sites from which artifacts were studied). In the Indus Valley, the copper-tin alloy is known at Mohenjo-Daro...Among the products attributed to Meluhha, lapis lazuli and carnelian are found in sites and tombs of the 3rd millennium. We can suggest with reasonable certainty that the tin used in Oman was in transit through Meluhha and that the most likely source was western Afghanistan...The collective indications are that western Afghanistan was the zone able to provide the tin used in Southwest Asia in the 4th and 3rd millennia. The occurrence of tin with copper ores and the signs of earl; exploitation make it obligatory for us to consider the problem of tin in direct connection with the metallurgy of copper in this region. Since our original research design was to define copper sources, the information on tin deposits was looked upon only as a complement. In order to elucidate the questions raised by our findings, a project aimed specifically at tin—its sources and metallurgy—should be organized." (Expedition, Volume 25 Issue 1 October 1982).
http://www.penn.museum/sites/expedition/early-tin-in-the-near-east/ Early Tin in the Near East -- A Reassessment in the Light of New Evidence from Western Afghanistan By: Serge Cleuziou and Thierry Berthoud

The largest tin belt of the globe is Southeast Asia. Tin-bronze revolution of ca. 5th millennium BCE can be explained by postulating a Tin Route which linked Hanoi to Haifa, more magnificent than and rivaling the later-day Silk Road. This Tin Route of yore was traversed by Bharatam Janam.

Source: http://pubs.usgs.gov/bul/1301/report.pdf Stanniferous ores are the key to tin-bronze revolution of 5th millennium BCE, creating the Tin Route more magnificent and stunning than the later-day Silk Road.

The task of the historian is to map this Route with Bharatam Janam at work creating the tin-bronze revolution.

Discovered in 1966 with bronze grave gifts is Ban Chiang (Thai: แหล่งโบราณคดีบ้านเชียง) an archeological site in Nong Han District,Udon Thani Province, Thailand. "Bronze making began circa 2000 BCE, as evidenced by crucibles and bronze fragments.Bronze objects include bracelets, rings, anklets, wires and rods, spearheads, axes and adzes, hooks, blades, and little bells." "White, J.C. 2008 Dating Early Bronze at Ban Chiang, Thailand. In From Homo erectus to the Living Traditions. Pautreau, J.-P.; Coupey, A.-S.; Zeitoun, V.; Rambault, E., editors. European Association of Southeast Asian Archaeologists, Chiang Mai, pp. 91-104(PDF).

Linked to this discovery is the discovery of Dong Son bronze drums in areas centered at the Red River Valley of northern Vietnam. This points to the beginnings of bronze castings in the Ancient Far East. Scenes cast on to the tympanum of the drums using cire perdue (lost-wax) casting techniques are of extraordinarily remarkable skill and with some hieroglyphs paralleling the Indus Script hieroglyphs. With drums weighing upto 72 kg the quantity of copper used for each drum would have used up 1 to 7 tons of smelted copper together with the alloying of about 10% or upto .7 tons of tin.

Left to right: house depicted on a Dongson drum, Toraja houses in Sulawesi, depiction of a Tien house in Yunnan

Salavo bronze drums. Hieroglyphs: frog, peacock, elephant, palm tree.

tALa 'palm' rebus: dhALa 'large ingot'.

maraka 'peacock' (Santali. Mu.) Rebus: मारक loha 'a kind of calcining metal' (Samskritam)

Skt. *mūkaka*- id. (DEDR 5023) Rebus: *mũh* ‘ingot’. Muha. The quantity of iron produced at one time in a native smelting furnace. (Santali) karibha 'trunk of elaphant' ibha 'elephant' rebus: karba 'iron' ib 'iron'. Hieroglyph: arka 'sun' Rebus: arka, eraka 'copper, gold, moltencast'. *miṇḍāl* ‘markhor’

(Tōrwālī) *meḍho* a ram, a sheep (Gujarati)(CDIAL 10120)

Rebus: *mẽṛhẽt, meḍ* ‘iron’ (Mu.Ho.)

maṇḍa (Sanskrit) OMarw. *mīḍako* m. ‘ frog ’, *mīṁḍakī* f. ‘ small frog ’, G. *me_ḍak*, *meḍ*°m., *me_ḍkī*, *meḍ*° f.; M. *mẽḍūk -- mukh* n. ‘ frog -- like face ’. 1. Pa. *maṇḍūka* -- m., °*kī* -- f. ‘ frog ’, Pk. *maṁḍū˘ka* -- , °*ḍūa* -- , °*ḍuga* -- m., (CDIAL 9746) Rebus: *mẽṛhẽt, meḍ* ‘iron’
(Mu.Ho.)

kaṅká m. ‘ heron ’ VS. [← Drav. T. Burrow TPS 1945, 87; onomat. Mayrhofer EWA i 137. Drav. influence certain in *o* of M. and Si.: Tam. Kan. Mal. *kokku* ‘ crane ’, Tu. *korṅgu*, Tel. *koṅga*, Kuvi *koṅgi*, Kui *kohko*] Pa. *kaṅka* -- m. ‘ heron ’, Pk. *kaṁka* -- m., S. *kaṅgu* m. ‘ crane, heron ’ (→ Bal. *kang*); B. *kā̃k* ‘ heron ’, Or. *kāṅka*; G. *kā̃kṛũ* n. ‘ a partic. ravenous bird ’; -- with *o* from Drav.: M. *kõkā* m. ‘ heron ’; Si. *kokā*, pl. *kokku* ‘ various kinds of crane or heron ’, *kekī* ‘ female crane ’, *kēki* ‘ a species of crane, the paddy bird ’

(*ē*?).(CDIAL 2595) *Ta.* kokku common crane, *Grus cinerea*; stork, paddy bird; kuruku heron, stork, crane, bird, gallinaceous fowl, aṉṟil bird. *Ma.* kokku, kokkan, kocca, kuriyan paddy bird, heron; kuru heron. *To.*košk heron. *Ka.* kokku, kokkare crane; kukku heron, crane. *Tu.* korṅgu crane, stork. *Te.* koṅga, kokkera, kokkarāyi crane; pegguru, begguru (< peru-kuru) adjutant crane. *Kol.* (Kin.) koŋga crane. *Pa.*kokkal (*pl.* kokkacil) id. *Ga.* (S) kokkāle (*pl.* kokkāsil) heron; (S.2) koŋalin (*pl.* koŋasil), (S.3) kokalin crane. *Go.* (L.) koruku id. (*Voc.* 921); (Mu.) kokoḍal heron, duck (*Voc.* 870); (Ma. Ko.) koŋga crane (*Voc.* 874). *Kui* kohko paddy bird. *Kuwi* (S.) kongi (Ṭ.) kokoṛa crane. *Br.* xāxūr demoiselle crane. / Cf. Skt. kaṅka- heron; Turner, *CDIAL*, no. 2595.(DEDR 2125) కొంగ (p. 0313) [koṅga] *konga*. [Tel.] n. A bird of the heron or stork kind. బకము (Telugu) Rebus: kang 'brazier' (Kashmiri)

The Dong Son Bronze Drums

Hebrew Bible, Ezekiel 27:12, says, *"Tarshish was your (Tyre) merchant because of your many luxury goods. They gave you silver, iron, tin, and lead for your goods." "The ships of Tarshish were carriers of your (Tyre's) merchandise. You were filled and very glorious in the midst of the seas. (Ezekiel 27:25)"*The mountains of Wales, just north of Cornwall have been a source of all the minerals and metals listed above in Ezekiel 27:12.

It is likely that Tarshish was NOT the source of tin-bronzes of Ancient Near East of 4th and 3rd millennia BCE because one cuneiform text specifically refers to Meluhha as the source of tin. The oldest direct evidence of pure tin is a tin ingot from the 1300 BCE Uluburun
shipwreck off the coast of Turkey which carried over 300 copper bars weighing 10 tons, and approximately 40 tin bars weighing 1 ton Another evidence comes from the three tin ingots of ca. 1200 BCE from Haifa shipwreck.

Mesopotamian EDI cuneiform texts from Ur distinguish between copper (urudu/eru) and tin=bronze (zabar/siparru). ED II/III texts from Fara (Limet 1960) mention metallic tin (AN.NA/annakum). Texts from Palace G at Ebla refer to the mixing of various ratios of 'washed' copper (a-gar(-gar)/abaru) and tin to produce bronze (Waetzoldt and Bachmann 1984; Archi 1993). The recipes are also found in the late 19th century BCE texs from Mari (Muhly 1985:282). Typical copper-tin ratios are from 6:1 to 10:1.

Two collections of cuneiform texts from Kultepe and from Mari dating to 19th and early 18th centuries BCE have references to tin trade. "These texts document a trade in which tin was moving exclusively from east to west. Arriving in Mesopotamia from the east, metallic tin was transhipped up the Euphrates to Mari, or overland to Assur. From Assur the tin (in addition to Babylonian textiles) was transported via donkey caravan to various Assyrian trading colonies such as Kanesh/Kultepe in Anatolia, where it was traded for silver and gold (Larsen 1976, 1987). From Mari, the tin was traded further west to sides in Syria and Palestine (Dossin 1970; Malamat 1971), and perhaps as far as Crete (Malamat 1971:38; Muhly 1985:282)." (p.179)

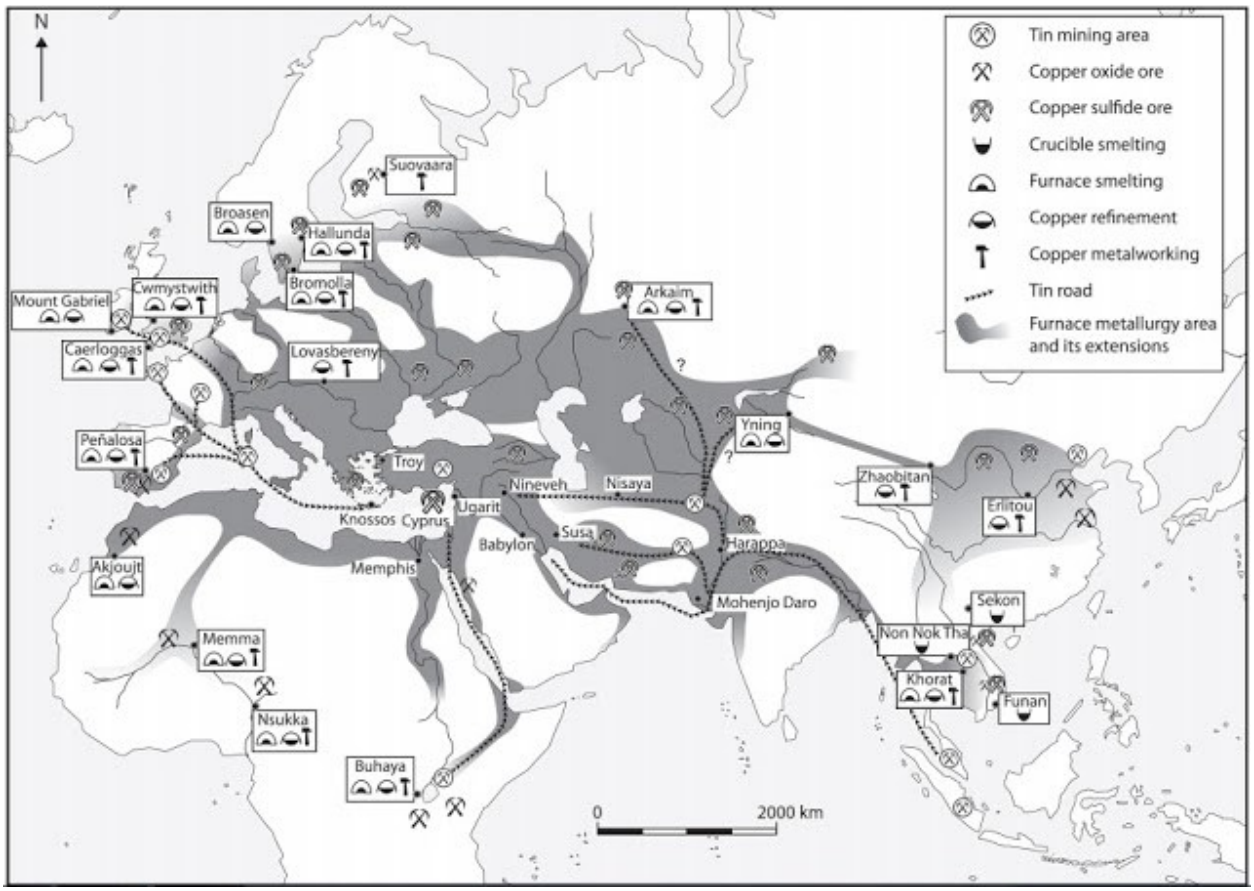
Hypothesis of an eastern source for tin; epic tale of Enmerkar and Lord of Aratta

"One text from the reign of Gudea of Lagash mentions that, in addition to lapis lazuli and carnelian, tin was also traded to Mesopotamia from the land of Meluhha. The relevant passage (Cylinder B, column XIV, lines 10-13) states that 'Gudea, the Governor of Lagash, bestowed as gifts copper, tin, blocks of lapis lazuli, [a precious metal] and bright carnelian from Meluhha. (Wilson 1996; see also Muhly 1973: 306-307). This is the only specific

cuneiform reference to the trade of tin from Meluhha...'A pre-Sargonic text from Lagash published by B. Foster (1997) and described as 'a Sumerian merchant's account of the Dilmun trade' mentions obtaining from Dilmun 27.5 minas (ca. 14 kg) of an-na zabar. This phrase can be literally translated as 'tin bronze', and Foster suggested the possible reading 'tin (in/for?) bronze'...The fact that the isotopic characteristics of the Aegean tin-bronzes are so similar to those from the Gulf analyzed in this study adds further weight to the hypothesis of an eastern source for these early alloys...The possibility of tin coming from these eastern sources is supported by the occurrence of many tin deposits in modern-day Afghanistan, Uzbekistan and Tajikistan, although evidence for tin extraction is currently limited to the central Asian sites of Karnab and Mushiston, and goes only as far back as the second millennium BCE...Yener has argued cogently against a 'on-source-for-all' model of the third millennium tin trade, and does not regard the proposed tin mining and processing in the Taurus Mountains as inconsistent with the importation of large amounts of tin into Anatolia. Taurus in production is thought to have co-existed with large-scale exchange of foreign metal in the third millennium, before the eventual 'devastation' of Anatolian tin mining operations by the availability of 'purer, already packaged, readily-available tin' from the Old Assyrian trade (Yener 2000:75)...IN particular, for regions such as Baluchistan, the Indus Valley, and the Gulf, which show significant third millennium tin-bronze use, the exclusive use of tin or tin-bronze from Afghanistan and central Asia seems highly likely. Textual sources are scarce, but highlight the trade through the Gulf linking Mesopotamia with Meluhha, Magan and Dilmun as the most common source of tin in the latter third millennium BCE, after an earlier overland Iranian tin-lapis-carnelian trade hinted at by the epic tale of Enmerkar and the Lord of Aratta. " (pp.180-181)

Muhly, JD, 1973, Copper and tin. *Transactions, The Connecticut Academy of Arts and Sciences* 43: 155-535.

Muhly, J.D. (1985), "Sources of tin and the beginnings of bronze metallurgy", *Journal of American Archaeology*, **89** (2), pp. 275–291
http://bharatkalyan97.blogspot.in/2014/01/meluhha-and-tracking-tin-road-after-all.html

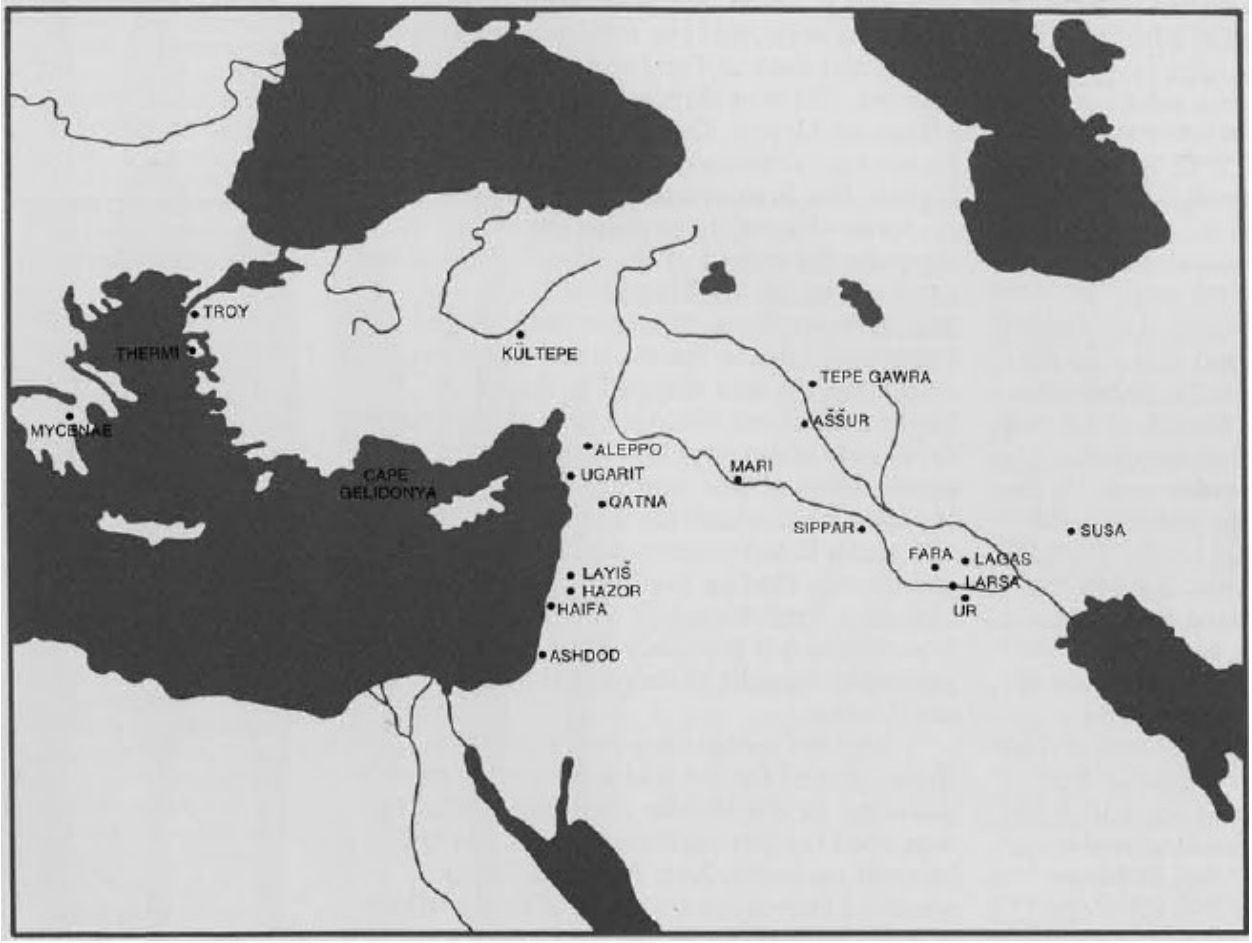


"Almost all the third millennium BCE cuneiform texts from southern Mesopotamia which mention specific toponyms as copper sources speak of copper from either Magan or Dilmun (T. F. Potts 1994:Table 4.1). Meluhha, the third polity of the Lower Sea, is mentioned only rarely as a copper supplier, and then for amounts of only a few kilograms (Leemans 1960:161). The common association of Meluhha with the supply of carnelian, lapis lazuli, gold, precious woods, and especially ivory, suggests that the toponym is to be
related to the region between the Makran coast and Gujarat, encompassing sites of the Indus civilization (Heimpel 1993)." (p.15)

"Mesopotamia, as has often been stated, lacked resources. Its lack of metal ores required this world, at times, independent city-states and, at other times, empire, to look to distant lands in order to procure its metal/ores. Mesopotamian technology, however, was not a form of administrative or scribal concern. When it came to metal technology written texts offer limited information and are all but silent on the training, organization, and recruitment of metal smiths. Similarly, the texts are vague, or more typically silent, as to the geographical provenience from whence they obtained their metal/ore, its quantity, quality, price, or techniques of fabrication. It is left to the archaeologist and the recovered metal artifacts, workshops, associated tools, and mines, to address these questions...Decades ago VG

Childe placed metallurgy on the top of his list of important crafts. He maintained that the development of early civilizations was a consequence of the invention of metallurgy (Childe 1930). Bronze-working, he believed, encouraged the manufacture of tools, which in turn led to more productive agriculture, and the growth of cities. Seventy-five years ago, Childe (1930:39) could point out that 'Other documents from Mesopotamia, also written in the wedge-like characters called cuneiform, refer to the importation of copper from the mountainous region east of the Tigris and of metal and stones from Magan (probably Oman on the Persian Gulf)"…(Lloyd Weeks) introduces us to a new corpus of metal artifacts from the United Arab Emirates. Surprisingly, a significant percentage of these metals, recovered from the site of Tell Abraq, are tin-bronzes…his volume offers an up-to-date review of the enduring 'tin-problem' within the context of the greater Near East. Again, Childe (1928: 157) confronted the problem: 'The Sumerians drew supplies of copper from Oman, from the Iranian Plateau, and even from Anatolia, but the source of their tin remains unknown'…(Lloyd Weeks) states '…the absolute source of the metal (tin-bronze) is likely to have been far to the north and east of Afghanistan or central Asia'. The central Asian source has been given reality by the recent discovery in Uzbekistan and Tadzhikistan of Bronze Age settlements and mines involved in tin production (Parzinger and Boroffka 2003)." (From CC Lamberg-Karlovsky's Foreword in: Weeks, Lloyd R., 2003, *Early metallurgy of the Persian Gulf –Technology, trade and the bronze age world*, Brill Academic Publishers, Boston, pp. vii-viii).

See full text: https://drive.google.com/file/d/0B4BAzCi4O_l4aWVMWVFHY25oMGs/edit?usp=sharing Early metallurgy of the Persian Gulf

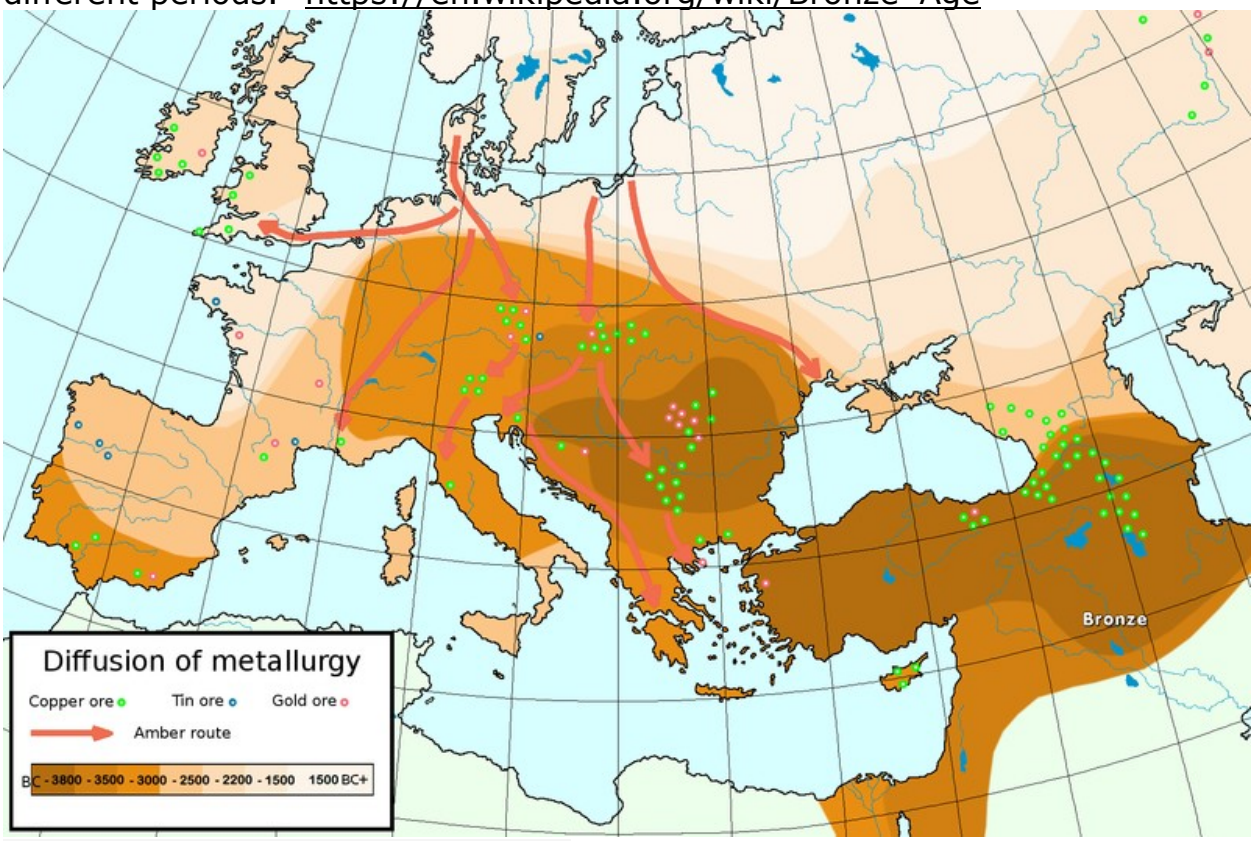


Map showing major sites in the Near East

"Bronze is an alloy consisting primarily of copper, commonly with about 12% tin and often with the addition of other metals (such as aluminium, manganese, nickel or zinc) and sometimes non-metals or metalloids such as arsenic, phosphorus or silicon. These additions produce a range of alloys that may be harder than copper alone, or have other useful properties, such as stiffness, ductility or machinability. The archeological period where bronze was the hardest metal in widespread use is known as the Bronze Age. In the ancient Near East this began with the rise of Sumer in the 4th millennium BC, with India and China starting to use bronze around the same time; everywhere it gradually spread across regions." https://en.wikipedia.org/wiki/Bronze

"The Bronze Age is a time period characterized by the use of bronze, proto-writing, and other early features of urban civilization. The Bronze Age is the second principal period of the three-age Stone-Bronze-Iron system, as proposed in modern times by Christian Jürgensen Thomsen, for classifying and studying ancient societies. An ancient civilization is defined to be in the Bronze Age either by smelting its own copperand alloying with tin, arsenic,

or other metals, or by trading for bronze from production areas elsewhere. Copper-tin ores are rare, as reflected in the fact that there were no tin bronzes in western Asia before trading in bronze began in the third millennium BCE. Worldwide, the Bronze Age generally followed the Neolithic period, with the Copper ageserving as a transition. Although the Iron Age generally followed the Bronze Age, in some areas, the Iron Age intruded directly on the Neolithic from outside the region...Bronze was independently discovered in the Maykop culture of the North Caucasus as early as the mid-4th millennium BC, which makes them the producers of the oldest known bronze. However, the Maykop culture only had arsenical bronze. Other regions developed bronze and its associated technology at different periods." https://en.wikipedia.org/wiki/Bronze_Age



Map of the diffusion of metallurgy. in Europe and Asia Minor. The darkest areas are the oldest. After M. Otte (2007) *Vers la Préhistoire*, de Boeck, Bruxelles

"The land between the Euphrates and Tigris is sedimentary and therefore devoid of metals...Some semi-precious stones came from an even greater distance, cornelian from the Indian subcontinent, and lapis lazuli from Central Asia...The regions furthest to the East about which the ancient Mesopotamians had some knowledge appear to be the Indus valley (Meluhha) and Turkmenistan (Shimashki). The legendary country Aratta figures in several Sumerian epics as the distant adversary of Uruk. One can find references to the alleged trade between Uruk and Aratta in the

secondary literature...Of great importance are the remains of the cargo discovered in two Late Bronze Age shipwrecks off the South coast of Turkey. The wreck near Cape Gelidonya (late 13th c. BCE) is thought to have come from Phoenicia. Its cargo consisted mainly of copper, tin, and bronze: copper in the shape of 34 oxhides (averaging 25 kg each)) and a number of bun ingots (averaging 3 kg each), tin ingots, and scrap bronze tools. Beter preserved is the shipwreck of Uluburun (late 14th c.) with a cargo of an estimated 20 tons of weight, including 354 copper oxhide ingots (1bout 10 tons), 121 copper bun ingots (about 1 ton), 110 tin ingot fragmens (about 1 ton), and 175 glass ingots (about 300 kg.)...The copper used in Syria and Mesopotamia came from different sources according to the textual evidence. One route led via the southern city of Ur, which possessed a harbour giving access to the Persian Gulf and beyond. The copper obtained from Tilmun from ca. 21st-18th c. BCE came from Oman, where impressive remains of ancient copper workings have been identified dating to this period...Tin is alloyed with copper to obtain bronze. It is first attested in a pin from Tepe Gawra Level VIII (ca. 3000 BCE), with a content of 5.6% tin. At the time of the royal tombs of Ur (Early Dynastic IIIa. ca. 2700 BCE), bronze appears to be the most commonly used...Weeks contrasted the very limited presence of tin-bronzes in third millennium context in sites of the Iranian Plateau to the significant use of tin-bronze in Baluchistan, the Indus Valley, the Persian Gulf and south-western Iran during the same period. Since the use of tin will have been greatest along the trade route by which it was transported, he convincingly argues that this tin came via the Indian peninsula from one or more Central Asian sources. This is the famous trade with distant Meluhha, which started in the third millennium with the growing importance of the Indus civilisation, and lasted until its decline in about 1900 BCE. The supply of tin by sea route is suggested in a passage in one of the texts of Gudea (Cyl. B xiv 13): 'Along with copper, tin, slabs of lapis lazuli, shining metal (and) spotless Meluhha cornelian' (RIME 3/1,96). After the collapse of Meluhha, tin apparently was traded by an overland route cross Iran. It probably was via this overland route that the tin reached Susa in western Iran from where it was distributed westwards as is documented for the Old Babylonian period. One important route in Mesopotamia ran East of he Tigris to Assur in the North, from where Assyrian traders transported large quantities of tin to Anatolia (documented for the 19th-18th c.). The fact that they exported tin to Anatolia corroborates the view that workable deposits did not exist there...The latest reference to this city (Assur) as a source of tin is contained in an Old Babylonian letter found at the Middle Euphrates site of Haradum, which dates to the reign of Ammi-shaduqa (1683-1626 BCE). The passage reads: 'I entrusted 1 talent 20 minas of tin (= 40kg) to Hushunu, the Ahlami soldier, a guard of the *kārum* of Haradu, (in) Assur and I had him carry it to Haradum'...King Zimrilim's merchants were allowed to purchase tin and lapis lazuli in Susa. Zimrilim

used the tin as diplomatic gifts to rulers in Ugarit, Hazor and other places in the Levant. The gifts made by Zimrilim and earlier by his predecessor Yasmah-Addu (to the king of Apishal) seem to be the only attested cases of tin moving to West Syria by way of Mari...The Uluburn shipwreck discovered off the Turkish coast had a cargo of almost 1,000 kg of tin and (Cypriot) copper, and apparently was heading for a western destination when it sank...tin figures among the tribute, which Neo-Assyrian kings received in North Syria and in the region around Diyarbakir. For example, king Ashurnasirpal II (883-859 BCE) received tribute from Patina (near modern Antakya), which included 600 kg of silver, 30 kg of gold, 3000 kg of iron, and 3000 kg of tin (RI-MA 2, 217 f.)...end of the Neo-Assyrian period (reign of Sin-shar-ishkun, ending 612 BCE), where tin (*bdl*) is mentioned as payment for a horse or a gift to the god hadad of Gozan. Less than a century later, Transeuphratene was the area where Babylonian merchants from Neo-Babylonian Uruk obtained tin for the Eanna temple according to several texts...Old Assyrian trade (20th-18th c. BCE)...linked the city of Assur with Central Anatolia...(trade) profited from the development of an institutional and legal framework to acommodate trade from about 2000 BCE onwards, in which groups of merchants from a particular town forged long-term relationships with other towns and their rulers through the *kārum*-system (*kārum* 'quay, harbour, commercial district). Non-Assyrian caravans brought tons of tin, cornelian and iron to Assur, where local merchants purchased these goods. By means of donkey caravans the goods were shipped to Anatolia and sold there for silver and gold. Kanesh was the main hub of a network of some twenty Assyrian commercial settlements in or close to economically important cities or regions in Anatolia. To facilitate this trade, Assur concluded treaties with local rulers that permitted it to establish trade colonies in existing cities of economic or logistical importance. A string of settlements also existed on the main caravan route from Assur to Anatolia in northern Iraq and Syria...The amount of tin and textiles sent by individual merchants to Anatolia differed considerably. A simple donkey load consisted of some 65 kg of tin, plus some textiles. One particular letter (Kt ck 443) announces the coming to Anatolia of a large convoy consisting of 21 donkeys, carrying 300 kg of tin and 400 assorted textiles. This represented significant load. The shipwreck of Uluburn, however, had a cargo of an estimated 10 tons of copper and 1 ton of tin. The ton of tin equals some 15 donkey-loads. Small as such an amount may seem, it is almost the total estimated yield of one of the mines discovered in Tajikistan. The shipment of textiles and tin to Anatolia was an Assyrian monopoly. There were no traders from Babylon active in Kanesh, but we know that merchants from North Syria (Ebla, Hashshum) were also involved in trade with Anatolia...Obviously, not only Mesopotamian merchants went abroad. Foreign merchants also travelled to Mesopotamia to sell goods. A royal inscription of the Old Akkadian King Sargon (2300) contains a unique hint at

the extent of long-distance trade, when he claims that he 'moored the ships of Meluhha, Magan, and Tilmun at the quay of Agade' (RIME 2, 28). The tin and textiles that Assyrian merchants exported to Anatolia reached Assur by means of caravans from Babylonia, and, presumably, Susa...The coastal kingdom of Ugarit was a centre from where copper, tin, alum or lapis lazuli could be sent on to Carchemish and Hatti...Two letters addressed to the king of Ugarit by Tagubli, his representative with the court of Carchemish, deal with the sending of genuine lapis lazuli as a gift to the Hittite king. Urtenu appears as a manager of the palace storage facilities and stables, able to issue horses and donkeys, as well as copper, tin, alum, blue-purple wool, and textiles."

(Jan Gerrit Dercksen, Mineral resources and demand in the Ancient Near East, in: *La Natura Nel Vicino Oriente Antico*, Atti del Convegno internationale, Milano, 2009, Edizioni Ares, pp. 43-75)

Ancient India (hieroglyphs, also known as Indus Script), Mesopotamia (cuneiform) and Egypt (hieroglyphs) developed the earliest writing systems.

The decipherment of Indus Script Corpora as metalwork catalogues provides the framework for analyzing the documented contributions of Ancient India and Ancient Far East to the Tin-Bronze Revolution.

Archaeometallurgical investigations are ongoing to loate the sources of tin which created the Tin-Bronze Revolution. With the discovery of three pure tin ingots in Haifa, Israel with Indus Script inscriptions, the possibility exists that AFE constituted the principal source of tin ore for the revolution.

An ERC (European Research Council) Project is ongoing to identify the sources of tin which realized the Tin-Bronze revolution.

Daniel Berger, Blanka Nessel, Ernst Pernicka, Gerhard Brugman, Carolin Frank, Janeta Marahrens are collaborators in

- :
- Bronze Age tin - Tin isotopes and the sources of Bronze age in the old world (ERC project) "Goal: This multidisciplinary project comprising archaeology, history, geochemistry, and geology aims at the decipherment of the enigma of the origin of a material that emerged in the third millennium BCE and gave an entire cultural epoch its name, namely the alloy of copper and tin called bronze. While copper deposits are relatively widely distributed there are only very few tin deposits known in the Old World (Europe, the Mediterranean basin and southwest Asia). Since the late 19th century archaeologists have discussed the question of the provenance of tin

for the production of the earliest bronzes without any definite answer. The enigma has even grown over the past decades, because it turned out that the earliest bronzes appear in a wide area stretching from the Aegean to the Persian Gulf that is geologically devoid of any tin deposits. There is tin in western and central Europe and there is also tin in central Asia. Thus, tin or bronze seems to have been traded over large distances but it is unknown in which direction. Now a new method has become available that offers the chance to trace ancient tin via tin isotope signatures. It was found that the isotope ratios of tin exhibit small but measurable variations in nature making different tin deposits identifiable so that bronze objects can in principle be related to specific ore deposits. It is proposed to apply for the first time this new technology to characterize all known tin deposits in the Old World and relate them to bronze and tin artefacts of the third and second millennia BCE. This groundbreaking interdisciplinary study will increase our understanding of Bronze Age metal trade beyond surmise and speculation with vast implications for the reconstruction of socio-economic relations within and between Bronze Age societies. The impact will be a major advance in our understanding of the earliest complex societies with craft specialization and the formation of cities and empires."

See: Fractionation of Zinnisotopes in Pyrometallurgical Processes and Corrosion of Metal Artifacts

- March 2018
- In book: Archäometrie und Denkmalpflege 2018: Annual Conference at the Deutsches Elektronen-Synchrotron Hamburg 20.-24.March 2018

- Publisher: Verlag Deutsches Elektronen-Synchrotron

- Editors: Leif Glaser "Abstract.
  BronzeAgeTin" - the project funded by the European Research Council with an Advanced Grant to investigate the usefulness of interest-rateotope analysis for archeology of origin, is coming to an end after four and a half years to take stock of the experimental work. Apart from new insights into the origin and distribution of bronze technology in the 3rd and 2nd millennium in the Middle East and Europe, almost 500 cassiterite and stannite samples from Europe to Central Asia were cinnisotopically characterized within the project duration. At the end, this will provide us with an extensive tin-heart data base for future projects. This was preceded by numerous experiments with the aim to find a suitable method for the digestion of cassiterite (Zinnstein), which, due to its resistance, can not be dissolved by acids or alkalis. However, since this is a mandatory prerequisite for multi-collector mass spectrometry with inductively-coupled plasma excitation (MC-ICP-MS), experiments were conducted on various smelting

methods to first transform the tin stone into highly soluble tin metal. Finally, the choice fell on the smelting or reduction with potassium cyanide, because in contrast to other methods (reduction with CO, cementation with copper, co-smelting with copper mineral), no tin in the form of volatile tin compounds (eg SnO) is lost, which leads to an unwanted isotope fractionation of tin (Brügmann et al. 2017; Berger et al. 2017)."
See: Tin isotope fractionation during experimental cassiterite smelting and its implication for tracing the tin sources of prehistoric metal artefacts

- March 2018

- Journal of Archaeological Science 92:73-86
-
- See: Tin isotope fingerprints of ore deposits and ancient bronze October 2017. The Aravalli Range, is one of the oldest fold mountain rangein the world; it is an eroded stub of ancient mountains, is the oldest range of fold mountains in India.(Roy, A. B. (1990). "Abstract. The sources and origin of tin, and the dispersion of bronze technology in the 3rd and 2nd millennium BC, are the central research topics of our multi-disciplinary research project, funded by an Advanced Grant of the European Research Council (ERC). It has the general goal to establish the tin isotopic composition of tin ores and tin-bearing artefacts, and considers the infl uence of anthropogenic processes on the isotope ratios. We discuss the tin isotopic composition of cassiterite from two major tin provinces in Europe: from Cornwall and Devon (Southern England), and from the Erzgebirge (Germany and Czech Republic). The samples from both tin provinces show a very large variation of isotopic compositions with δ124/120Sn-values ranging overall from -0.28 to 0.85‰. Although there is large overlap, on average, cassiterite from the Erzgebirge (δ124/120Sn = 0.09‰) is isotopically lighter than that of southwest England (δ124/120Sn = 0.18‰). This is due to a higher proportion of heavy isotope compositions in the samples from Cornwall and Devon. In addition, we compare the ore data with preliminary tin isotopic systematics in Early Bronze Age metal artefacts from the Únětice Culture in Central Germany and from several ancient settlements in Mesopotamia belonging to the Early Dynastic III and the Akkadian Periods. Bronze artefacts of the Únětice Culture containing more than 3 wt.% tin have rather constant isotopic compositions (δ124/120Sn = 0.2 to 0.31 ‰), despite having highly variable trace element concentrations and tin contents. This suggests the intentional addition of an isotopically homogeneous tin raw material (metal or cassiterite) to the copper ore or melt. In contrast, the tin isotopic composition of artefacts from Mesopotamia (>3 wt. % Sn) show a much larger δ124/120Sn variation from -0.2 to +0.4‰. This is even observed in single settlements such as Ur. Since there is no sizeable tin mineralization in the vicinity, this implies that the tin demand of the ancient metallurgist was covered by trading tin from different ore "

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- Evolution of the Precambrian crust of the Aravalli Range. *Developments in Precambrian Geology*, 8, 327-347.) The range rose in a Precambrian event called the Aravalli-Delhi Orogen... In ancient times, Aravalli were extremely high but since have worn down almost completely by millions of years of weathering, where as the Himalayas being young fold mountains are still continuously rising.

  Pre-Cambrian, sometimes abbreviated p€, or Cryptozoic spans from the formation of Earth about 4.6 billion years ago (Ga) to the beginning of the Cambrian Period, about 541 million years ago (Ma). https://en.wikipedia.org/wiki/Precambrian

  Aravalli range is the principal water divide between the Indus-Sarasvati basins in the north-west and Ganga-Yamuna-Brahmaputra basins in the east, covering extensive areas of the plains of north India.

  The **Aravalli Range** is a range of mountains running approximately 692 km (430 mi) in a southwest direction, starting in North India from Delhi and passing through southern Haryana, through to Western India across the states of Rajasthan and ending in Gujarat. https://en.wikipedia.org/wiki/Aravalli_Range

Map of prominent mountain ranges in India, showing Aravalli in north-west India

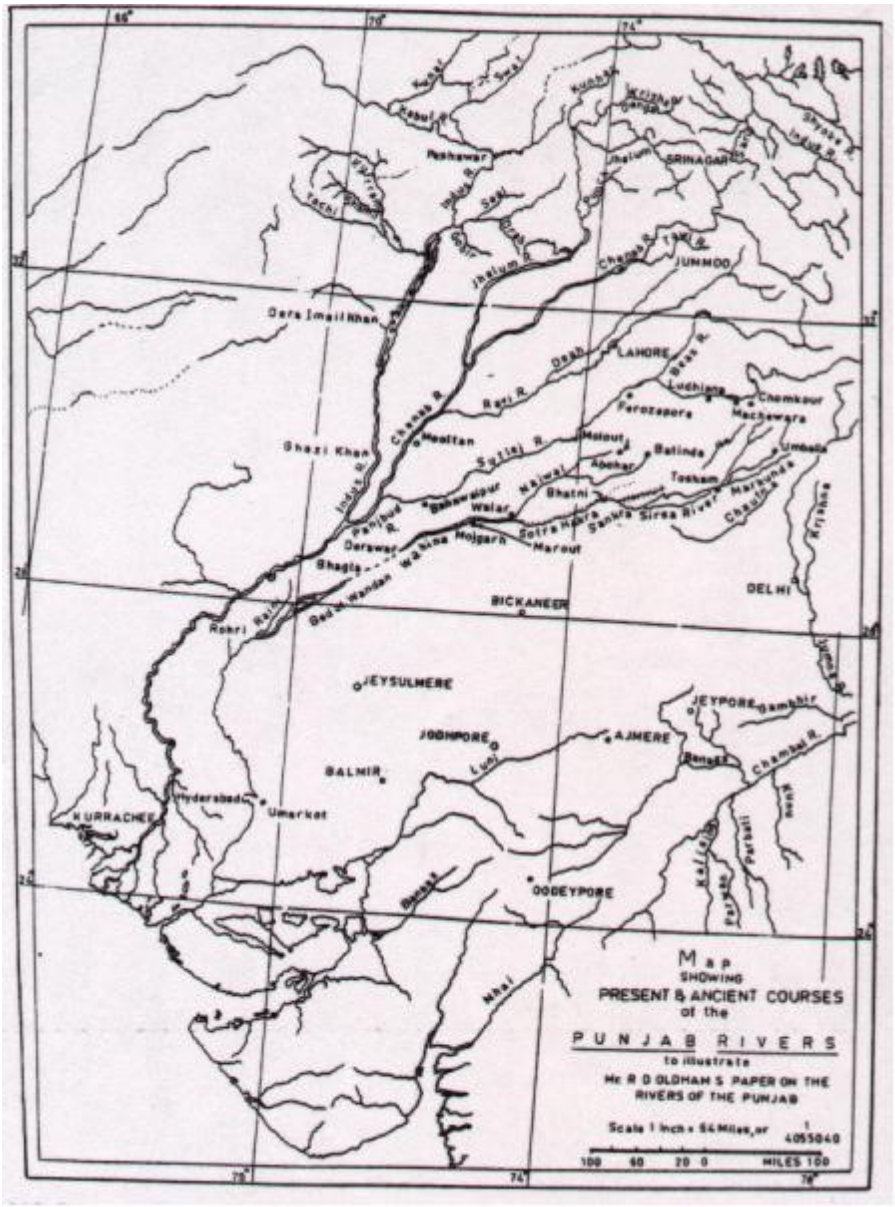
The Great Plains of Inia are Regional Divisions of the Indo-Gangetic-Brahmaputra Plains.

Rakhigarhi is located on the topographical ridge, an extension of Aravalli range which constitutes the water-divide of North India.

Rakhigarhi's geograpical location importance as the pattaṇa (riverine port) linkint riverine waterways of Sarasvati-Sindhu-Persian Gulf-Tigris-Euphrates-Mediterranean with Yamuna-Ganga-Brahmaputra river basins in the following plains.

1. Sindh Plain
2. Rajasthan Plain.
3. Punjab Plain.
4. Ganga Plain.
5. Brahmaputra Plain.
6. Ganga – Brahmaputra Delta

See: http://www.geologydata.info/rajasthan_geology.htm "Briefly stated, Rajasthan is endowed with a continuous geological sequence of rocks from the oldest Archaean Metamorphic, represented by Bhilwara Supergroup (>2500 m. y.) to sub-recent alluvium & wind blown sand. Vast unconsolidated deposits including the blown sand of the Thar Desert of western Rajasthan cover the western & NW parts of the state. The remaining area exposes wide variety of hard rocks including various types of metamorphic rocks like schist, quartzite, marble, and gneisses of Precambrian age with associated acid & basic intrusive rocks. The formations include the rocks of Aravalli Supergroup, Delhi Supergroup, upper Precambrian Vindhyan Supergroup and those of Cambrian to Jurassic, Cretaceous, and Tertiary ages. The southeastern part of the state is occupied by a pile of basaltic flows of Deccan traps of Cretaceous age. Several mineral deposits and renowned building stones of economic importance occur in association with the above rock units."



See: Oldham, R.D. 1887 On probable changes in the geography of the Punjab and its rivers- anhistorico-geographical study, J*ournal of the Asiatic Society of Bengal* 55 (2): 322-343.

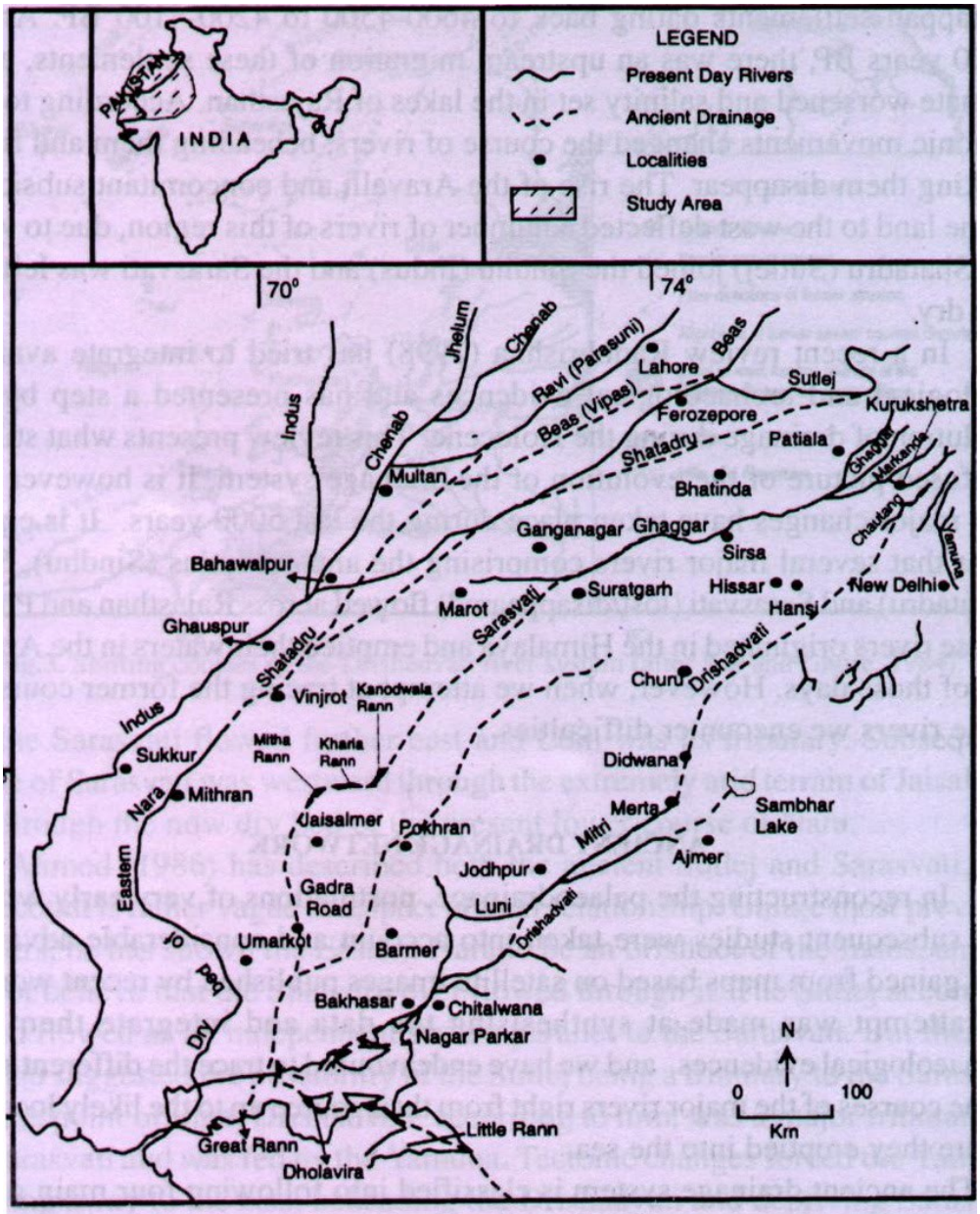
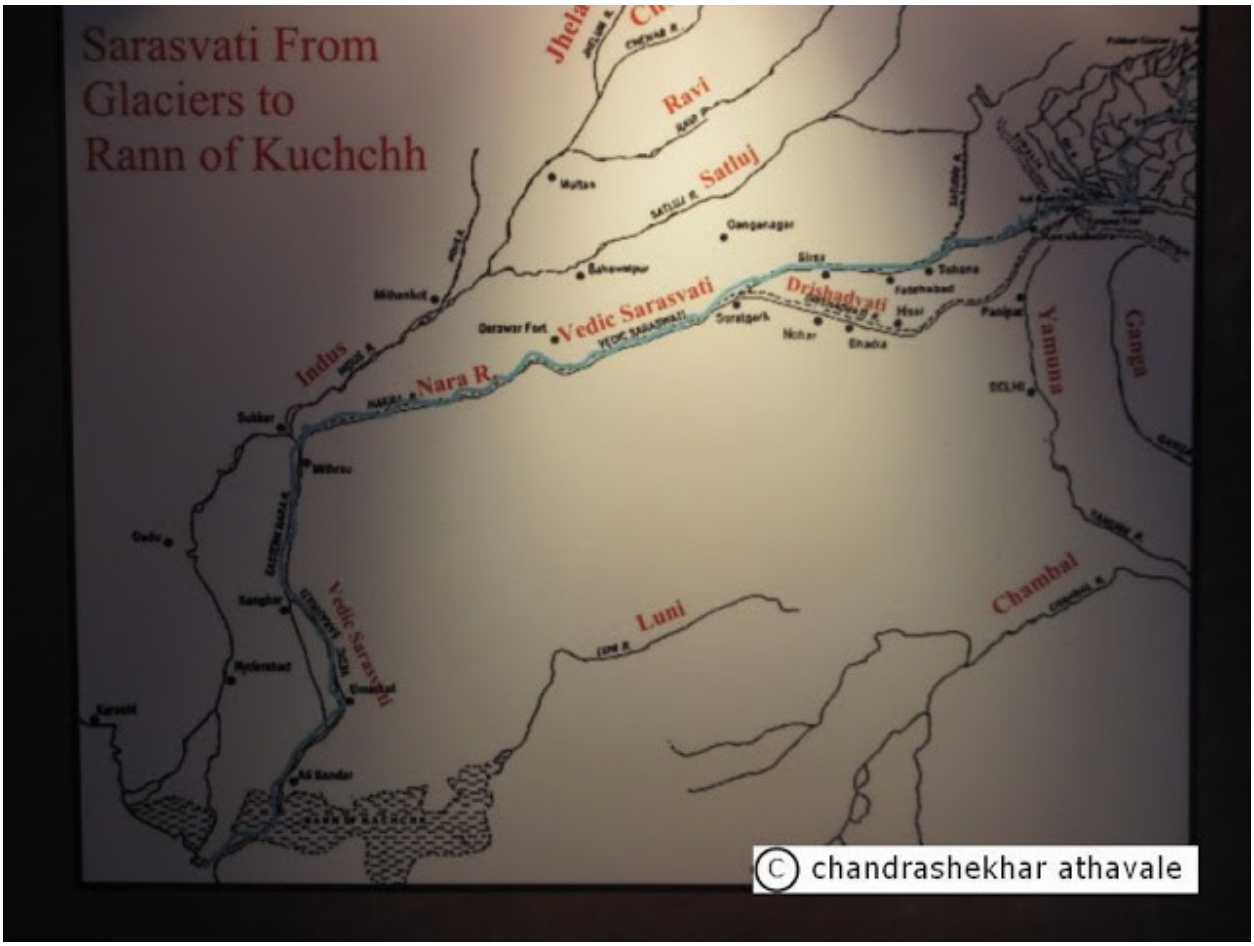
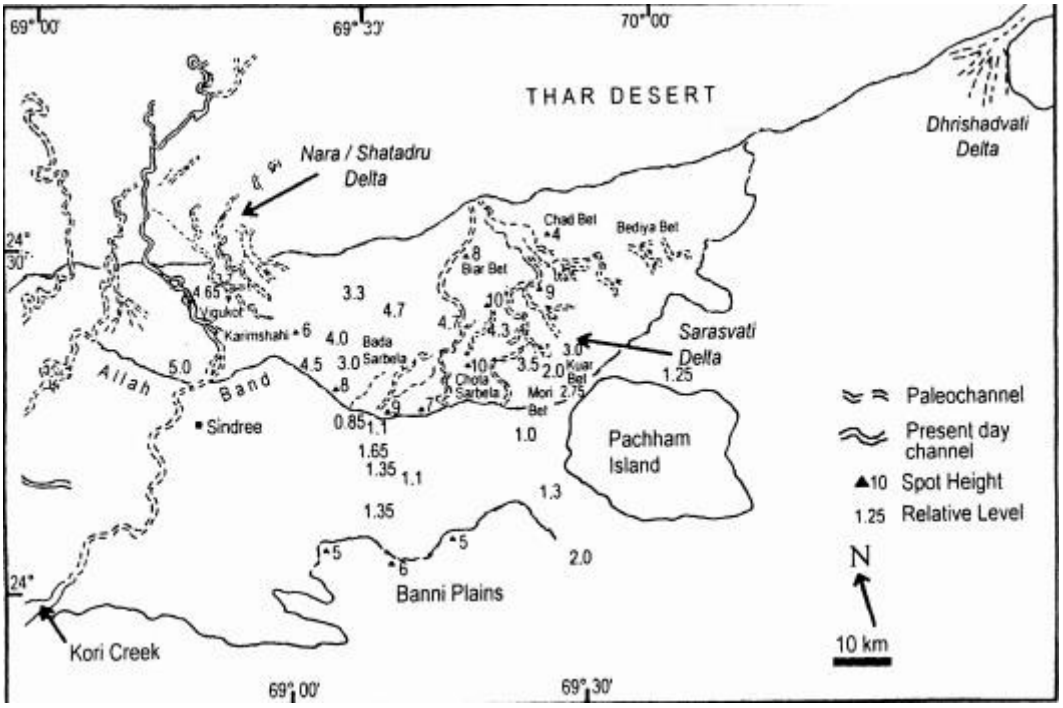
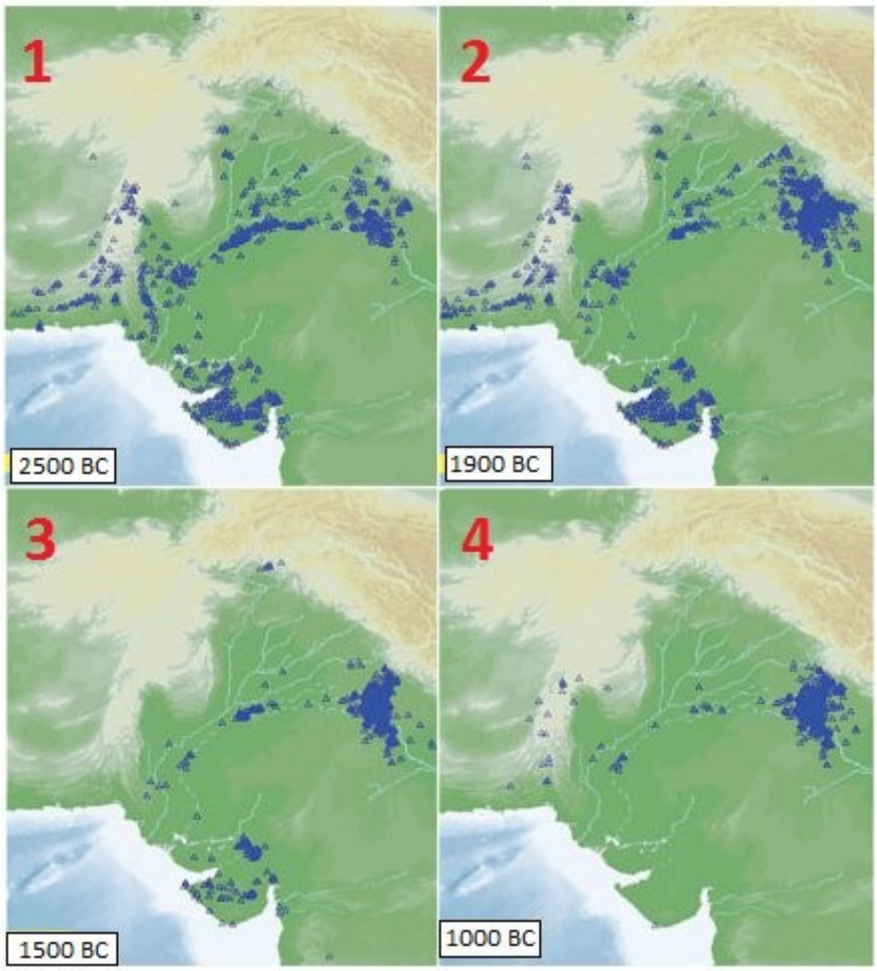


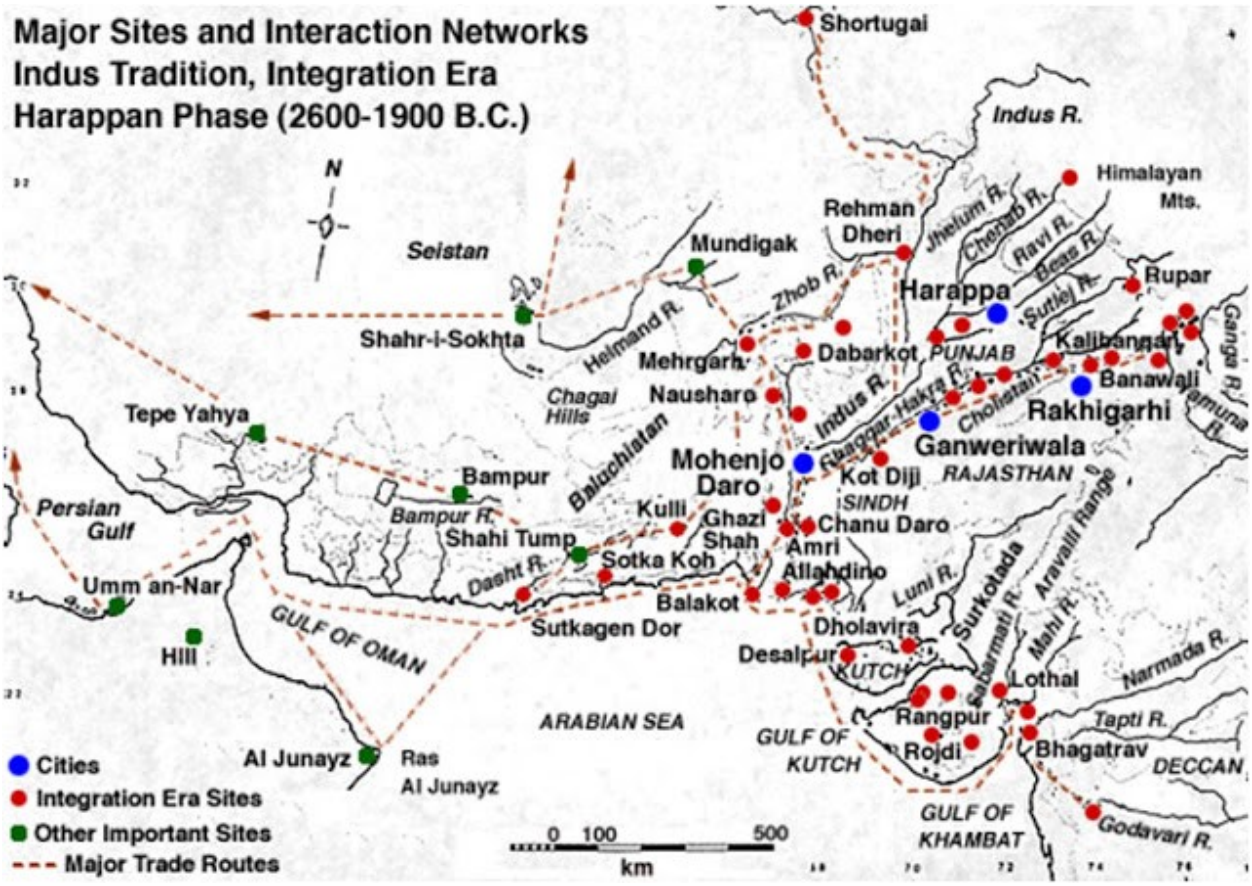
Fig.4. Present day and ancient rivers of northwestern India.

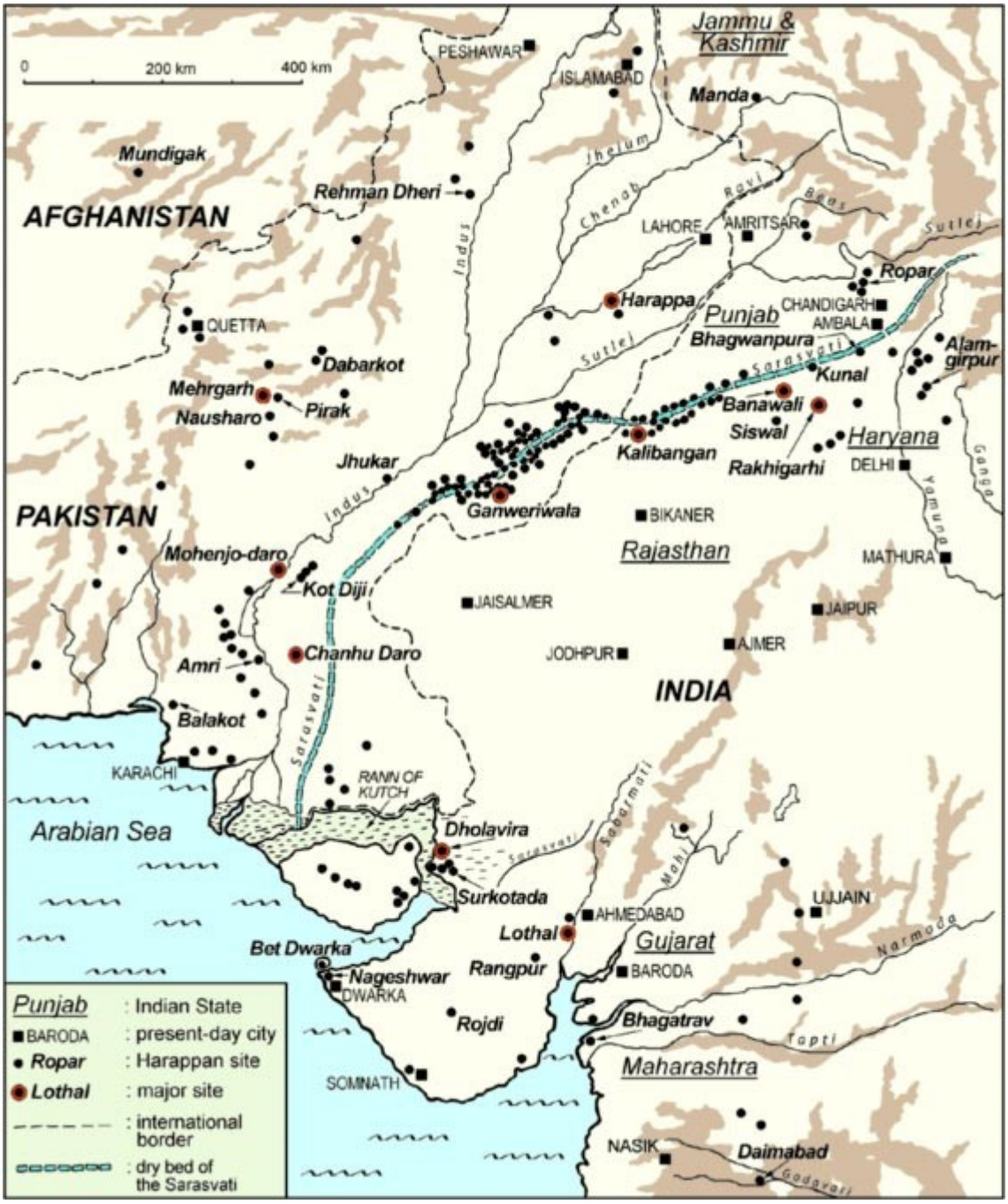

Sarasvati From
Glaciers to
Rann of Kuchchh
Ravi
Satluj
Vedic Sarasvati
Drishadvati
Indus
Nara R.
Yamuna
Ganga
Luni
Chambal
Vedic Sarasvati
© chandrashekhar athavale


69° 00'
69° 30'
70° 00'
THAR DESERT
Dhrishadvati Delta
Nara / Shatadru Delta
Chad Bet
Bediya Bet
Biar Bet
Sarasvati Delta
Kiyar Bet
Mori Bet
Allah Band
Sindree
Pachham Island
Banni Plains
Kori Creek
24° 30'
24°
Paleochannel
Present day channel
▲10 Spot Height
1.25 Relative Level
N
10 km

Map showing the bird's foot palaeo-delta complex representing the mouths of three rivers identified as Shatadru (Hakra), Saraswati and Drishadvati (after ali et al.; after Fig. 3 in: Roy, AB & SR Jakhar, Late quaternary drainage disorganization, and migrtion and extinction of the Vedic Saraswati in Current Science, Vol. 81, No. 9, 10 November 2001, pp. 1188-1195 Source: http://tejas.serc.iisc.ernet.in/~currsci/nov102001/1188.pdf http://bharatkalyan97.blogspot.in/2013/08/dholavira-gateway-to-meluhha-gateway-to.html "Several lines of geological evidence confirm the existence of a high-energy fluvial regime in western Rajasthan during the Late Quaternary period. Geomorphic description of the extinct river system matches well with the Saraswati River described so vividly in the Rig Veda. The Vedic river which presumably flowed parallel to the Aravalli Mountains during its initial stages, migrated westward during neotectonic uplift of the Aravalli Mountains. The neotectonic movements, which brought about the down-sagging of the northern part of Aravalli Mountains also forced the Yamuna River to swap its original course to flow across the flattened 'mountain'. The river presumably pirated the Saraswati waters while it drifted eastward to join the Ganges." (Roy, A., & Jakhar, S. (2001). Late Quaternary drainage disorganization, and migration and extinction of the Vedic Saraswati. *Current Science, 81*(9), 1188-1195.) http://www.jstor.org/stable/24106435

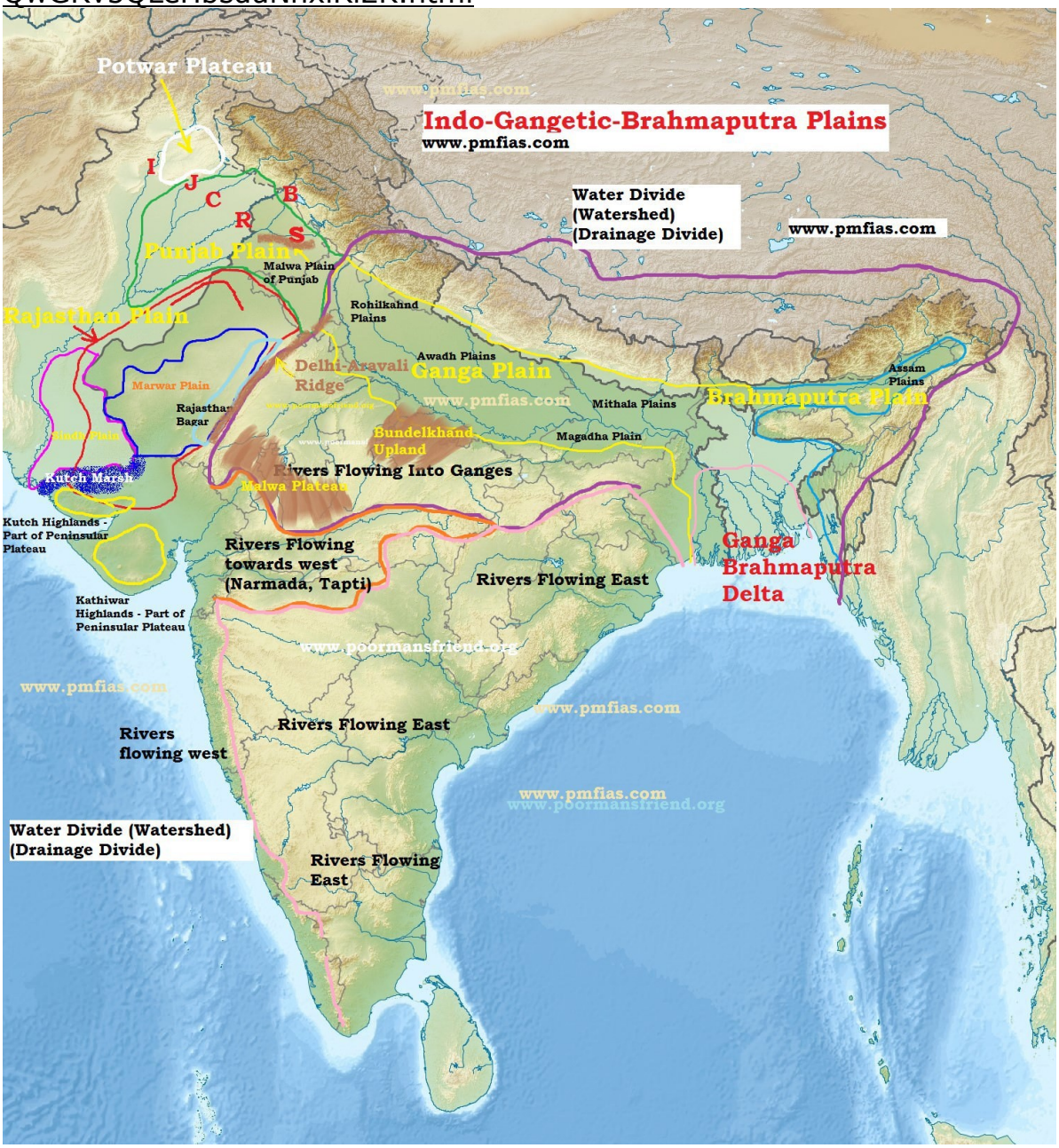

1
2500 BC
2
1900 BC
3
1500 BC
4
1000 BC


Major Sites and Interaction Networks
Indus Tradition, Integration Era
Harappan Phase (2600-1900 B.C.)
N
Seistan
Shortugai
Indus R.
Himalayan Mts.
Rehman Dheri
Mundigak
Jhelum R.
Chenab R.
Ravi R.
Beas R.
Sutlej R.
Rupar
Harappa
Zhob R.
Helmand R.
Shahr-i-Sokhta
Mehrgarh
Dabarkot
PUNJAB
Kalibangan
Banawali
Ganga R.
Yamuna R.
Chagai Hills
Nausharo
Indus R.
Ghaggar-Hakra R.
Cholistan
Rakhigarhi
Tepe Yahya
Baluchistan
Ganweriwala
Mohenjo Daro
Kot Diji
RAJASTHAN
Bampur
Persian Gulf
Bampur R.
Kulli
Ghazi Shah
SINDH
Chanu Daro
Shahi Tump
Amri
Allahdino
Dasht R.
Sotka Koh
Umm an-Nar
Luni R.
Sukkotada
Aravalli Range
Balakot
Dholavira
GULF OF OMAN
Sutkagen Dor
Desalpur
KUTCH
Saharmati R.
Mahi R.
Lothal
Narmada R.
Hili
ARABIAN SEA
Rangpur
Tapti R.
GULF OF KUTCH
Rojdi
Bhagatrav
DECCAN
Al Junayz
Ras Al Junayz
GULF OF KHAMBAT
Godavari R.
Cities
Integration Era Sites
Other Important Sites
Major Trade Routes
0 100 500
km


0
200 km
400 km
PESHAWAR
ISLAMABAD
Jammu & Kashmir
Manda
Mundigak
AFGHANISTAN
Rehman Dheri
Indus
Jhelum
Chenab
Ravi
Beas
Sutlej
LAHORE
AMRITSAR
Ropar
Harappa
Punjab
CHANDIGARH
AMBALA
QUETTA
Bhagwanpura
Alam-girpur
Dabarkot
Sarasvati
Kunal
Mehrgarh
Pirak
Nausharo
Banawali
Siswal
Haryana
Kalibangan
Jhukar
Rakhigarhi
DELHI
Ganga
Yamuna
PAKISTAN
Indus
Ganweriwala
BIKANER
Rajasthan
Mohenjo-daro
Kot Diji
MATHURA
JAISALMER
JAIPUR
Chanhu Daro
JODHPUR
AJMER
Amri
INDIA
Balakot
KARACHI
RANN OF KUTCH
Arabian Sea
Dholavira
Sabarmati
Mahi
Surkotada
AHMEDABAD
UJJAIN
Lothal
Gujarat
Bet Dwarka
Rangpur
Narmada
Nageshwar
DWARKA
BARODA
Rojdi
Bhagatrav
Tapti
Maharashtra
SOMNATH
NASIK
Daimabad
Godavari
Punjab : Indian State
BARODA : present-day city
Ropar : Harappan site
Lothal : major site
: international border
: dry bed of the Sarasvati

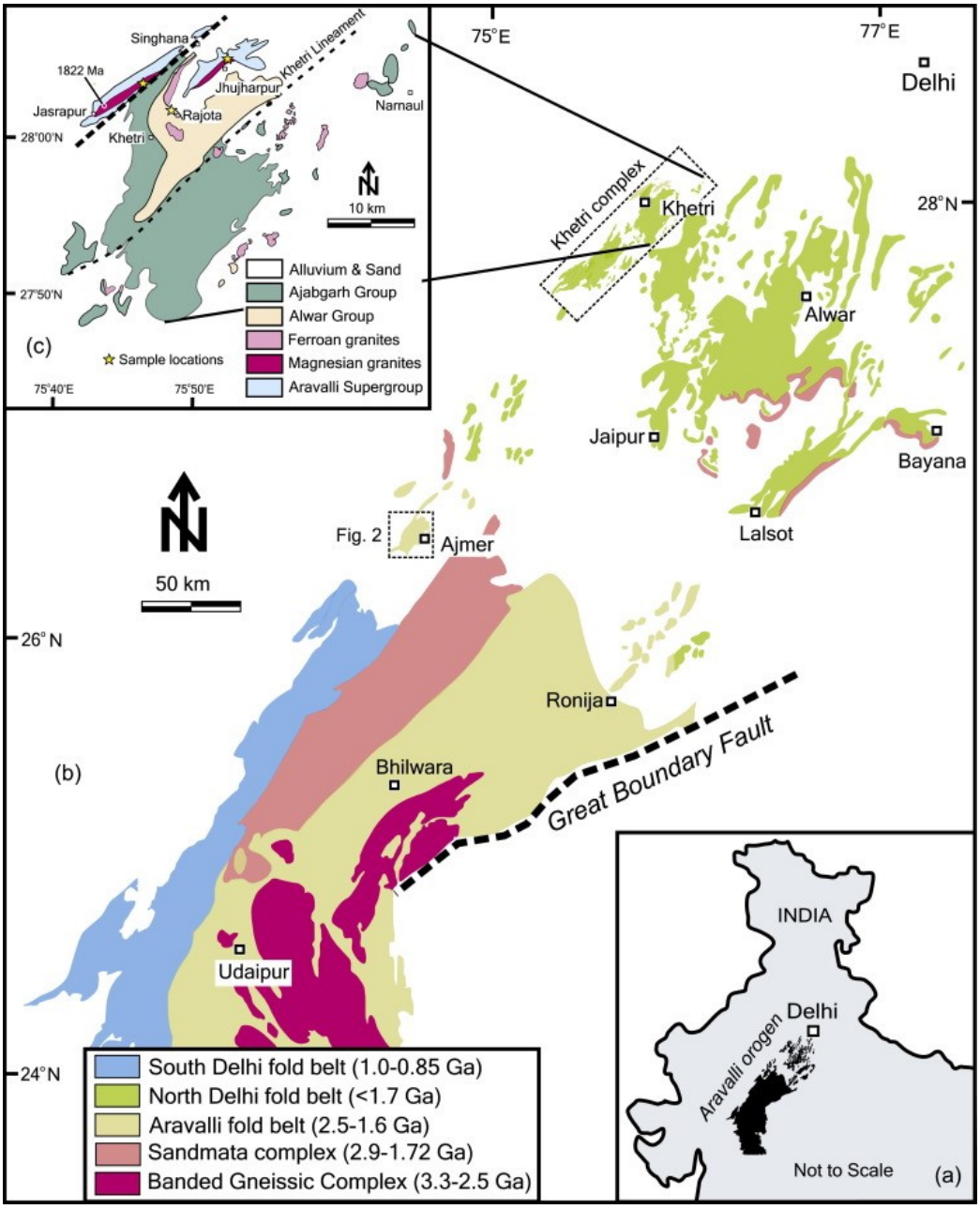
Source: https://www.hindustantimes.com/delhi-news/delhi-s-green-lung-aravallis-facing-desertification-ridge-cover-down-40/story-

QwGRv5QLeHbsduNhxlRl2K.html



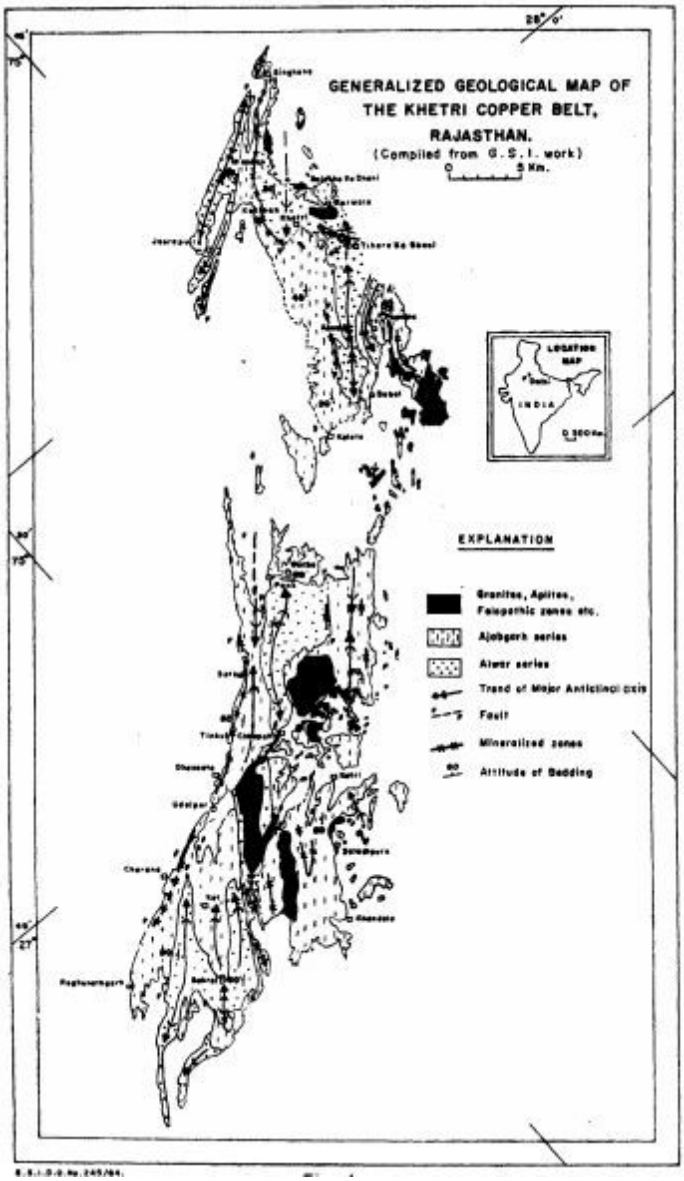
The Aravalli Range, seen from the range's highest point at Guru Shikhar, in Rajasthan.

Aravalli range is the dominant structural control of the vast plains extending from Rann of Kutch upto Assam.The South Central Delhi Ridge is within the Aravalli range which extends through Jhandewalan and upto Simla, and explains the nature of drainage systems of North India rivers flowing west and flowing east. Yamuna flows eastwards links up with Chambal and Ganga river basin which further links up with Brahmaputra rives basin, while Drishadvati-Chautang-Sarasvati river systems flow westwards.



This map points to the structural control exercised by the Aravalli range and signifies the importance of the geographical location of Rakhigarhi close to Khetri mines, making its location central to its emergence as Capital of the Sarasvati Civilization linking Ancient Far East and Ancient Near East through Himalayan, rivering waterways.

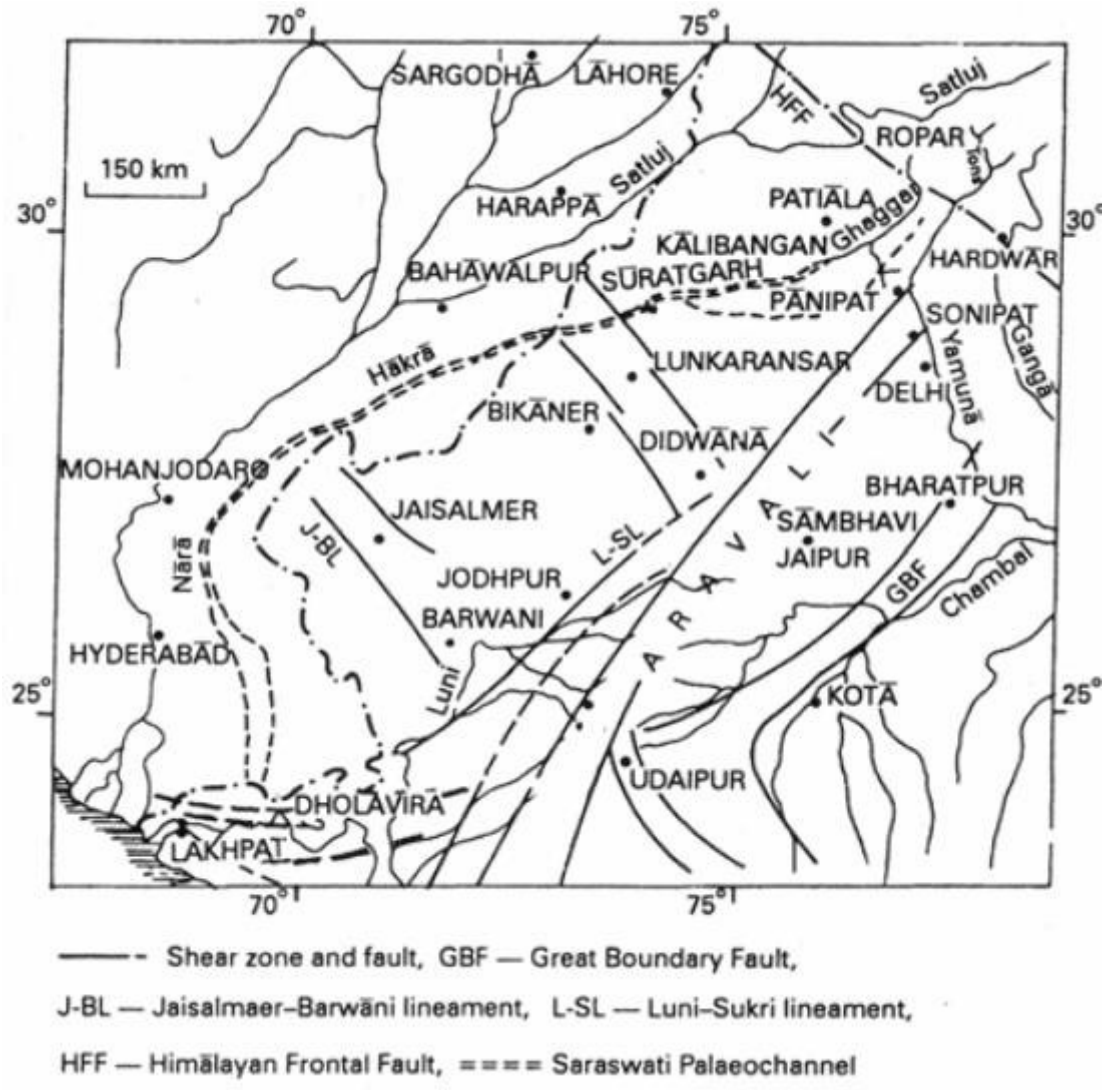
See: ParampreetKaur, ArminZeh, NaveenChaudhri, 2017,

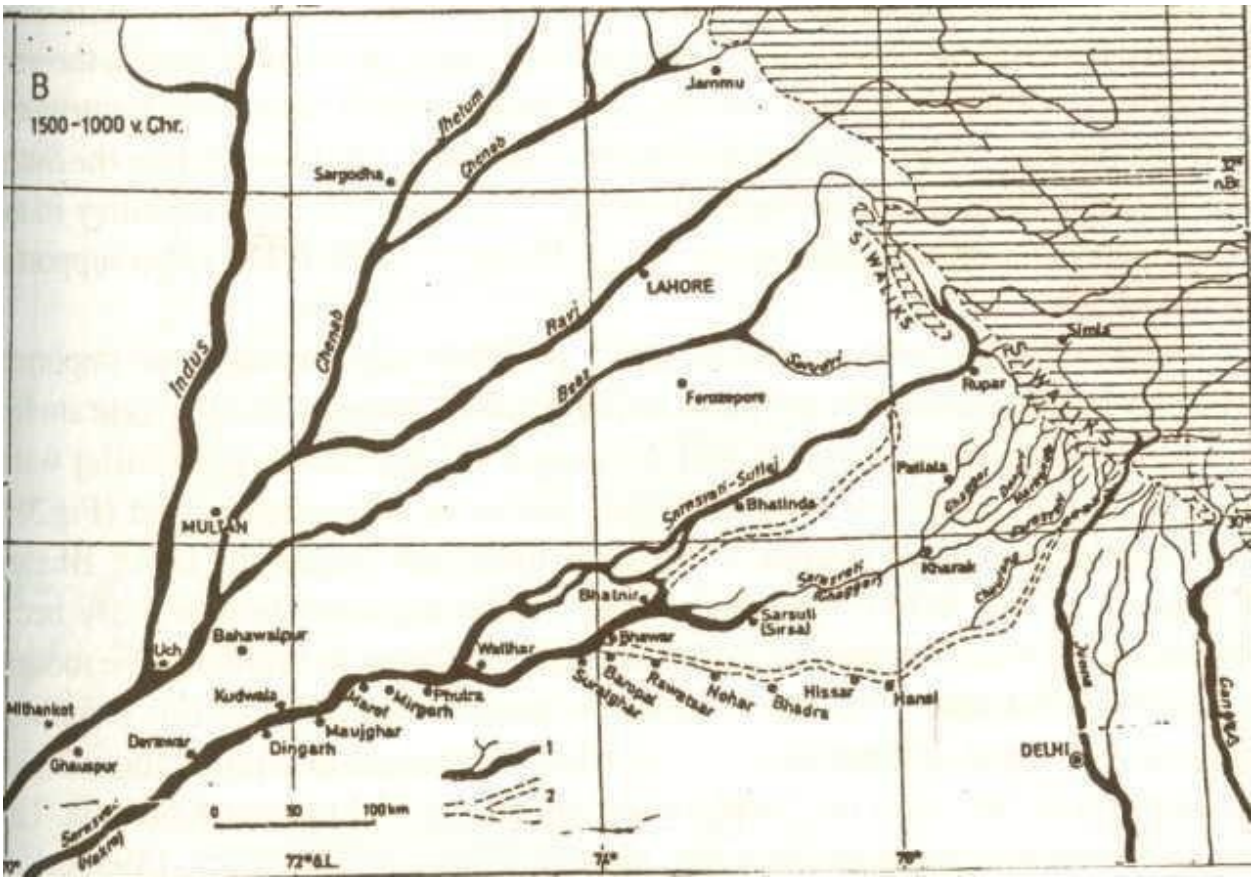


Palaeoproterozoic continental arc magmatism, and Neoproterozoic metamorphism in the Aravalli-Delhi orogenic belt, NW India: New constraints from *in situ* zircon U-Pb-Hf isotope systematics, monazite dating and whole-rock geochemistry, in:*Journal of Asian Earth Sciences* Volume 136, 1 April 2017, Pages 68-88

See: "The Aravali terrane is a highly deformed Proterozoic mobile beltentangled with an Archaean craton. It is split along its length by a number of crustal-scale shear zones, and dislocation zones developed in it during Precambrian time. Reactivation in the Late Quaternary of the shear zones is manifest in some areas, such as in the sinking of ground with a resultant formation of saline lakes, the bulging up of other areas with attendant watershed migration, the stream capture, the entrenched

meander loops, and the persistent moderate to low seismicity in the fault-ridden northeastern part of the Aravali terrane. Separated from this consolidated complex by the Great Boundary Fault, which registers a cumulative throw of 500–1300 m, the vast Vindhyan Basin of Proterozoic sediments is largely undeformed, except for around its tectonic boundary with the Aravali in the west and the Satpura in the south. However, the Vindhyan basement is segmented by wrench faults as well as strike faults, some of which register a strike-slip motion. The pronounced development of badlands close to the northern faulted border against the Ganga Plain indicates a very slow uplift of the northern part."
(K.S.Valdiya, JaishriSanwal,2017, Developments in Earth Surface Processes, Chapter 9 - Aravali and Vindhyan Terranes Volume 22, 2017, Pages 223-236)
https://www.sciencedirect.com/science/article/pii/B9780444639714000098





"Aravalli water divide trending NNE to SSW separates the Indus River basin of North West joined by Sutlej, Ravi, and Jhelum. Towards the east of Aravalli, Yamuna and Ganga and it's tributaries drain into the Bay of Bengal. The Ganga river system doesn't only drain the Himalayan rivers but also some peninsular rivers. The peninsula itself slopes North East and the Vindhyan scarpland acts as water divide for it. The Vindhyan scarpland is flanked by the Narmada-Son-Damodar lineament on the south and presents a slope towards north through which Chambal, Betwa, Ken, Son flow."

https://www.quora.com/How-have-the-water-divides-of-India-determined-the-drainage-of-India

"Abstract. The Aravalli hills form the sky-line of north-west India i.e. Gujarat, Rajasthan, Haryana states and Delhi union territory stretching from south-west and north-east direction. Extending for about 692 km. from Palanpur in Gjuarat upto Delhi union territory through Rajasthan and Haryana states, this range forms the main water divide of the north Indian drainage system. At few places in the Aravalli range, the hills are discontinuous and gaps exist. In the absence of the adequate forest stock on the Aravalli hills, these gaps turned active and caused drifting of desert sand towards fertile plains engulfing parts of 'Haryana of India' consisting of eastern Rajasthan, Punjab, Haryana, Delhi union territory, western Uttar

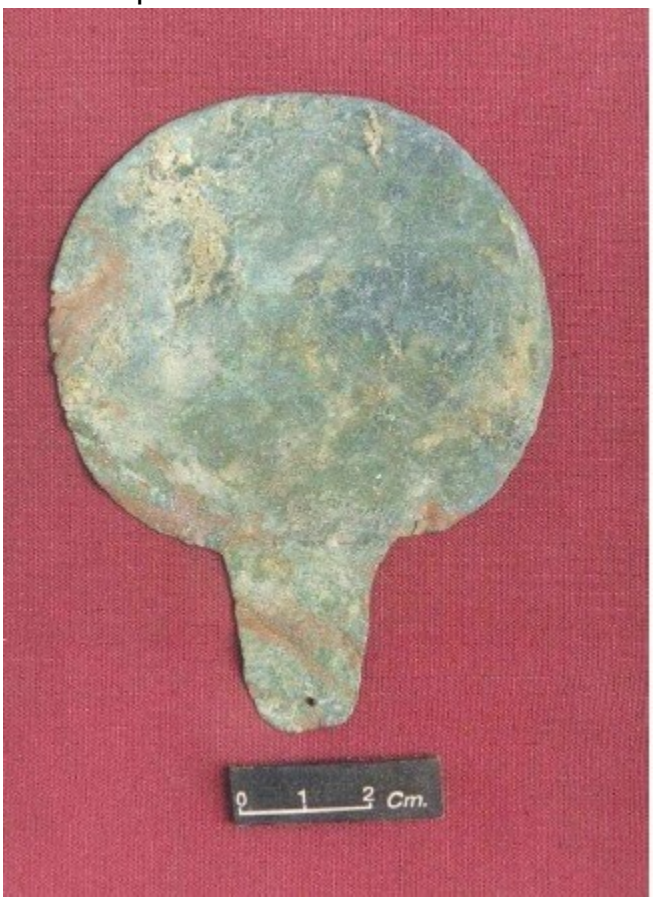
Pradesh. The Aravalli hills, one of the oldest hill systems of the world, form most dominant geological structure in the formation of the north Indian terrain and drainage system. It intersects Rajasthan into two major geographical units on its two sides. The western part occupying about two third of the state, is almost and the eastern part is comparatively well drained and fertile. The Aravalli hills spread in 12.65 per cent area of Rajasthan, influencing ecological equilibrium in 29.92 per cent of the state area directly whereas climatically and hydrologically influence much large area in the state and the surrounding regions indirectly. The Aravalli hill region extends in parts of eighteen districts and covers fully or partly 120 Development Blocks of the Rajasthan State."

http://a-a-r-s.org/aars/proceeding/ACRS2009/Papers/Oral%20Presentation/TS22-02.pdf Narpat Singh Rathore, 2009, The study of the changing environment and its impact in the Aravalli mountain range in the western regions of India, in: Asian Association of Remote Sensing (AARS) Proceedings

 ''Triple monkey figurine amulet with hole in center. This miniature carved faience bead or pin ornament shows three monkeys in tight embrace with amused expressions on their faces. Possibly placed on a stick or cord. Possibly molded and carved.'' From Mohenjo Daro.
Distribution of Indus-related sites (white dots) and excavated sites (red dots): Indian Punjab, Haryana, Uttar Pradesh and northern Rajasthan. Source : *Current state of research and issues of Indus Archaeology : Focusing on field researches and material cultural studies * by Akinori Uesugi.

Distribution of Indus-related sites (white dots) and excavated sites (red dots), map by Akinori Uesugi,(Kansai University/Kanazawa University).

The sculptural frieze of Halebidu shows a lady with *ādarśá* m. ‘ mirror ’ ŚBr.



Bronze mirror. Rakhigarhi. Hieroglyph: आर्श *mfn.* (fr. ऋश्य) , belonging to the antelope AV. iv , 4 , 5. ऋश्य or (in later texts ऋष्य) *m.* the male of a species of antelope , the painted or white-footed antelope RV. viii , 4 , 10 AV. v , 14 , 3 VS. तरेय-ब्राह्मण, सुश्रुत). Rebus: आ-दर्श a looking-glass , mirror (शतपथ-ब्राह्मण, बृहद्-ारण्यक-उपनिषद्, MBh.,रामायण) **ādarśá** m. ‘ mirror ’ ŚBr., *°aka* -- m. R. [√**dṛś**]Pa. *ādāsa* -- , *°aka* -- m., Pk. *ādaṁsa* -- , *°aga* -- , *āyaṁsa* -- , *°aga* -- , *āyāsa* -- ; -- MIA. **ādariśa* -- : Pk. *ādarisa* -- , *āya°* m.; Paš. *rešó*, Shum. *reṣe* (ṣ!), S. *āhirī* f., L. *ārhī*, *a°* f., WPah. jaun. *ārśī*, Ku. N. *ārsi;* A. *ārhi* ‘ likeness ’; B. *ārsi* ‘ mirror ’ (→ A. *ārsi*), Or. *ārisi*, *°asi*, Bhoj. Aw. lakh. *ārasī*, H. *ārsī* f.; OG. *ārīsaü* (< MIA. **āarissa* -- ?), G. *ārīsɔ*, *ar°*, *ārsɔ* m. ‘ large mirror ’, *ārsī* f. ‘ small do. ’, (→)P. *ārsī* f., S. *ārisī*, *ārsī* f.); M. *ārsā*, *ar°* m. ‘ small mirror ’, *ārśī*, *ar°* f. ‘ mirror ’.Addenda: **ādarśá -- :** S.kcch. *ārīso* m. ‘ mirror ’, WPah.kṭg. (kc.) *arśu* m., J. *ārśu.* (CDIAL 1143) Ādāsa Ādāsa [Sk. ādarśa, ā + dṛś, P. dass, of dassati[1] 2] a mir- ror Vin **ii.**107; D **i.**7, 11 (°pañha mirror -- questioning, cp. DA **i.**97: "ādāse devataŋ otaretvā pañha -- pucchanaŋ"), 80; **ii.**93 (dhamna° -- ādāsaŋ nāma dhamma -- pariyāyaŋ desessāmi); S **v.**357 (id.);

A **v.**92, 97 sq., 103; J **i.**504; Dhs 617 (°maṇḍala); Vism 591 (in simile); KhA 50 (°daṇḍa) 237; DhA **i.**226. -- tala the surface of the mirror, in similes at Vism 450, 456, 489. (Pali) Rebus: आ-दर्श 'a copy'(वराह-मिहिर 's बृहज्जातक).

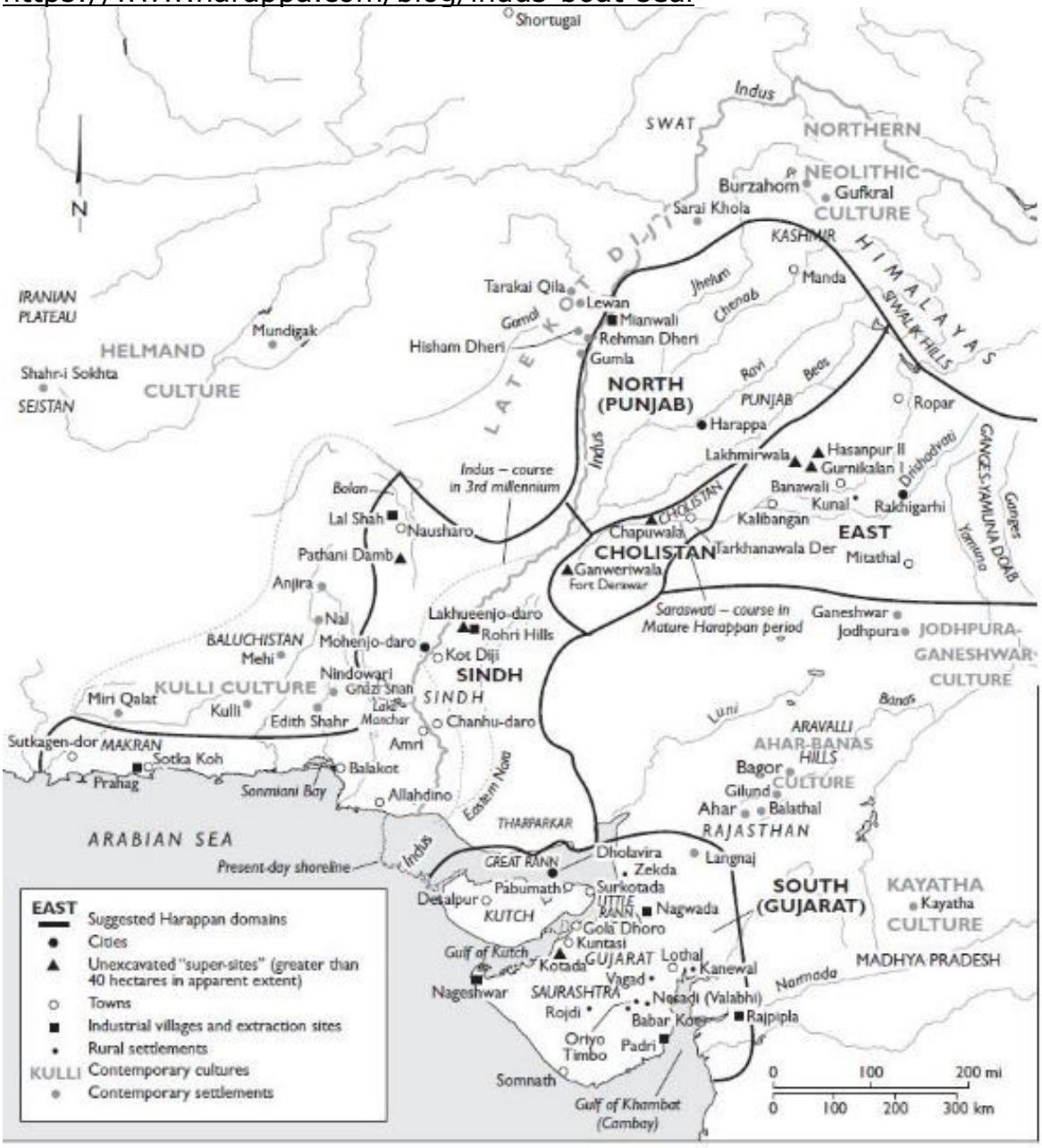
'An unfired steatite seal and sealing of a boat found at Mohenjo-daro. A close and insightful reading by Ernest J.H. Mackay reads "Seal 30 ... was found in two pieces. It is rectangular in shape and incomplete motif on the back consists of roughly scratched lines that cross one another... The face is nearly complete and it clearly bears a representation of a ship, the first of its kind to be found one a seal from Mohenjo-daro... Why representations of boats and ships are so rare it is difficult to explain, as it is more than probable that the river Indus was largely used for traffic of all kinds, and river craft should have been perfectly familiar to the inhabitants of Mohenjo-daro.

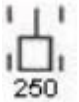
The vessel portrayed on this seal is boldly but roughly cut, apparently with a triangular burin, and is apparently not the work of an experienced seal cutter; hence its interest, because, probably as a consequence of inexperience, the motif is not a stereotypical one. The boat has a sharply upturned prow and stern, a feature which is present in nearly all archaic representations of boats; for example, the same boat appears in early Minoan seals, on the Predynastic pottery of Egypt, and on the cylinder seals of Sumer. In the last mentioned country, this type of boat was used down to Assyrian times. On the ivory knife-handle of Gebel-el-'Arak in the Louvre are depicted ships which bear a very close resemblance to the one on our seal; these and the other scenes on this handle are, indeed, explained by Petrie as not Egyptian, but the product of an Oriental people inspired by Elam and the Tigris region.

It will be noticed that this boat is shown as lashed together at both bow and stern, indicating perhaps that it was made of reeds like the primitive boats of Egypt and the craft that were used in the swamps of southern Babylonia. The hut or shrine in its center also appears to be made of reeds and fastened at each end of it is a standard bearing an emblem comparable, though not in actual shape, with the ensigns on the Gebel-el-'Ark handle. At one end of the boat on the seal from Mohenjo-daro a steersman whose head is unfortunately missing is seated at a rudder or steering-oar. The seal-cutter here was not at all sure of his figure and placed it well above the seal.

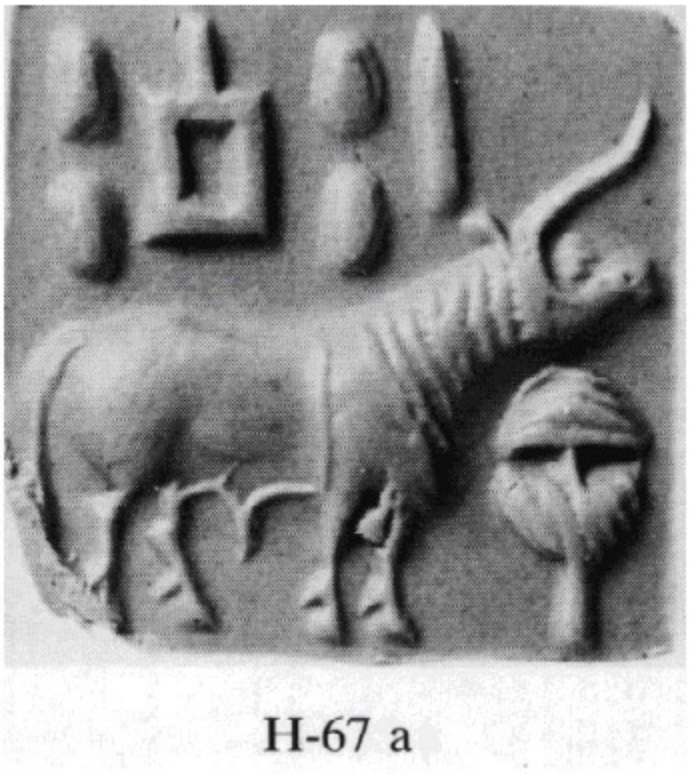
The absence of a mast suggests that this boat was used only for river work, as are some of the wooden boats on the Indus at the present day; though the modern boats have a less acutely upturned prow and stern, they usually have a similar cabin-like erection in the middle, sometimes constructed of wood and sometimes of reeds. The boats of today are chiefly used for fishing and are either rowed or punted against the stream.

This seal is invaluable in indicating a type of vessel that was in use in ancient Sindh. Its owner was perhaps connected with shipping of some kind for in in engraving it most careful attention had been paid to detail. (E.J.H. Mackay, *Further Excavations at Mohenjo-daro*, 1938, p. 340-1)."
https://www.harappa.com/blog/indus-boat-seal






249 Sign 250 is a hypertext formed of Sign 249 'liquid measure' and four short strokes as circumscript.



ranku, 'liquid measure' rebus: *ranku* 'tin' PLUS g*aṇḍa* 'four'

rebus: *kaṇḍa* 'fire-altar', 'equipment'. PLUS 86 Sign 86 *koḍa* 'one'
rebus: *koḍ* 'workshop'. Thus tin furnace, equipment workshop. The field symbols are: *poḷa* 'zebu' rebus; *poḷa* 'magnetite, ferrite ore' and खोंड khōṇḍa 'A young bull, a bullcalf'; rebus kundaṇa, 'fine gold' (Kannada); **konda** 'furnace, fire-altar' kõda कोंद 'furnace for smelting' कोंद **kōnda** 'engraver, lapidary setting or infixing gems'


M-1790 a

(Marathi) kundār 'turner'.


M-854 A

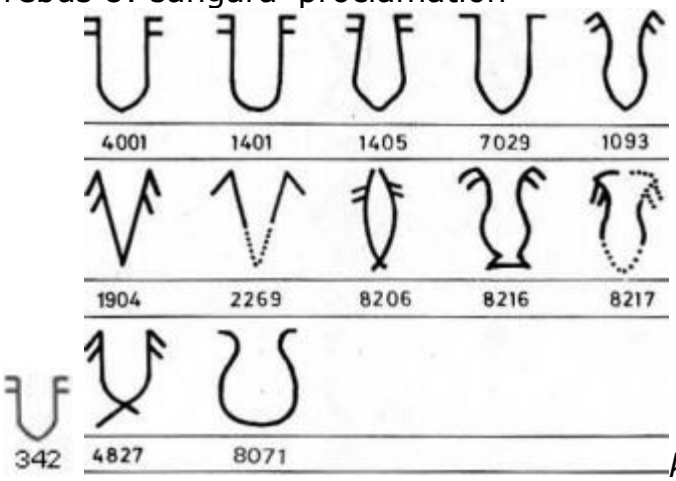
kuṭila ‘bent’ CDIAL 3230 kuṭi— in cmpd. ‘curve’, *kuṭika*— ‘bent’ MBh. Rebus: *kuṭila, katthīl* = bronze (8 parts copper and 2 parts tin) cf. āra-kūṭa, 'brass' Old English *ār* 'brass, copper, bronze' Old Norse *eir* 'brass, copper', German *ehern* 'brassy, bronzen'. kastīra n. ‘ tin ’ lex. 2. *kastilla -- .1. H. *kathīr* m. ‘ tin, pewter ’; G. *kathīr* n. ‘ pewter ’.2. H. (Bhoj.?) *kathīl*, °*lā* m. ‘ tin, pewter ’; M. *kathīl* n. ‘ tin ’, *kathlẽ* n. ‘ large tin vessel ’(CDIAL 2984) कौटिलिकः kauṭilikḥकौटिलिकः 1 A hunter.-2 A blacksmith PLUS dula ‘duplicated’ rebus: dul ‘metal casting’. Thus, bronze castings. [bronze castings] *dhāḷ* 'slanted stroke' rebus: *dhāḷako* 'ingot' PLUS खांडा khāṇḍā A jag, notch, or indentation (as upon the edge of a tool or weapon). *khaṇḍa* 'implements'. Thus, ingots and implements [ingots, implements]


M-1829 a


H-503 A

baraḍo = spine; backbone (Tulu) Rebus: *baran,bharat* 'mixed alloys' (5 copper, 4 zinc and 1 tin) PLUS *kaṇḍa* 'arrow' rebus:*khaṇḍa* 'implements'. Field symbol: young bull + standard device: 1. *koDiya* ‘rings on neck’, ‘young bull’ koD ‘horn’ rebus 1: *koṭiya* 'dhow, seafaring vessel' khōṇḍī 'pannier sack' खोंडी (p. 216) [khōṇḍī] *f* An outspread shovelform sack (as formed temporarily out of a कांबळा, to hold or fend off grain, chaff &c.)

khOnda ‘young bull’ rebus 2: kOnda ‘lapidary, engraver’ rebus 3: kundAr ‘turner’ कोंड [*kōṇḍa*] A circular hamlet; a division of a मौजा or village, composed generally of the huts of one caste. खोट [*khōṭa*] Alloyed--a metal 2. sangaDa ‘lathe’ sanghaṭṭana ‘bracelet’ rebus 1: .sanghāṭa ‘raft’ sAngaDa ‘catamaran, double-canoe’rebus čaṇṇāḍam (Tu. ಜಂಗಾಲ, Port. Jangada). Ferryboat, junction of 2 boats, also rafts. 2 jangaḍia 'military guard accompanying treasure into the treasury' ചങ്ങാടം čaṇṇāδam (Tdbh.;ಮಂಘಲಾಠಂ) 1. Convoy, guard; responsible Nāyar guide through foreign territories. rebus 3: जाकड़ ja:kaṛजांगड़ jāngāḍ ‘entrustment note’ जखडणें tying up (as a beast to a stake) rebus 4: sanghāṭa ‘accumulation, collection’ rebus 5. sangaDa ‘portable furnace, brazier’ rebus 6: sanghAta ‘adamantine glue‘ rebus 7: sangara ‘fortification’ rebus 8: sangara ‘proclamation’



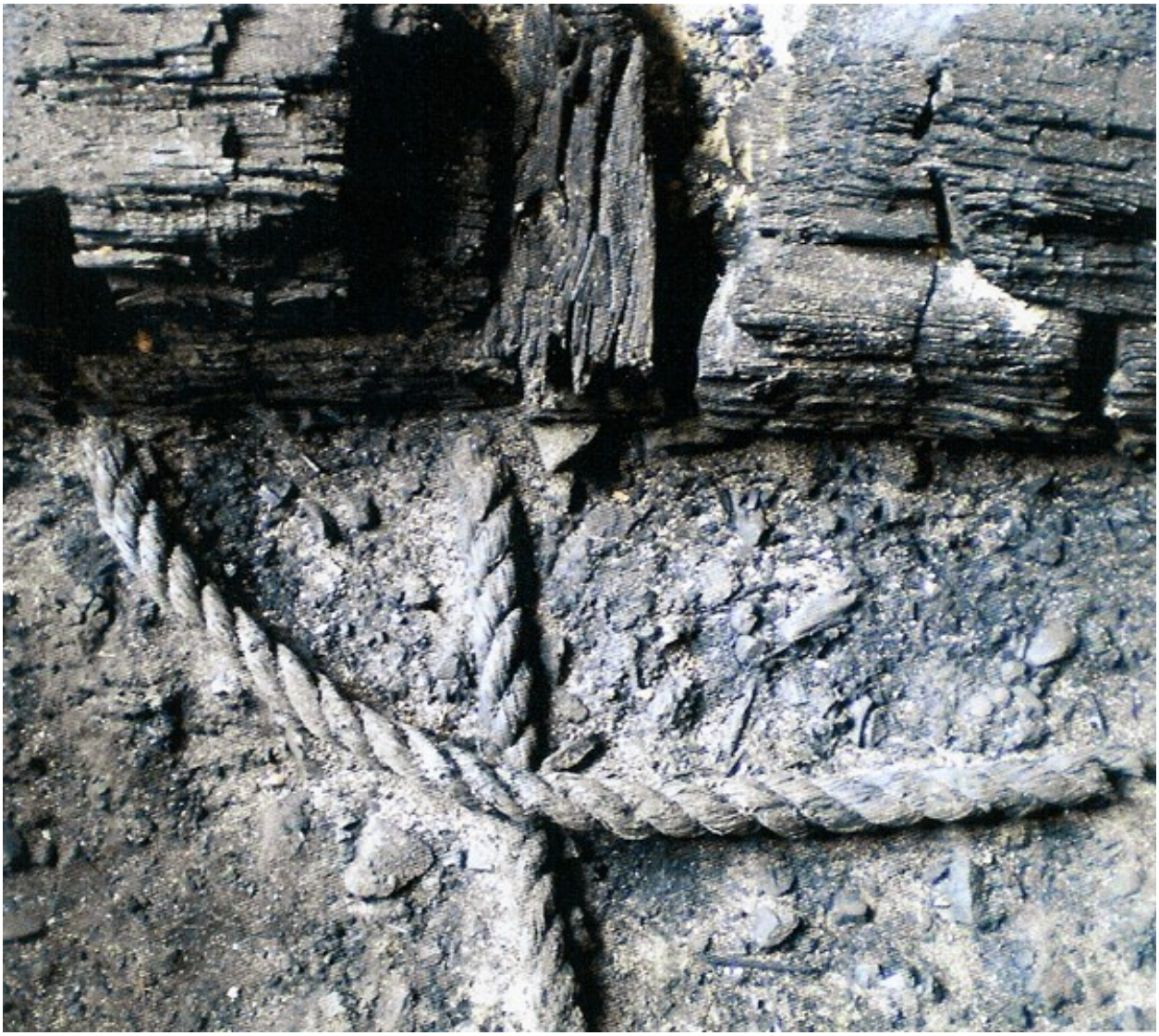
karṇika 'rim-of-jar' 'scribe; *karṇaka* 'steersman' *karṇi*'supercargo' *karaṇa* 'scribe' PLUS खांडा khāṇḍā A jag, notch, or indentation (as upon the edge of a tool or weapon). *khaṇḍa* 'implements'.

Ancient Bhārat of 19th cent. BCE as a Maritime, ship-building nation along Indian Ocean Rim, evidence of sewn boats from Red Sea port of Ayn Sukhna comparable to Kerala catamarans

https://tinyurl.com/y9n2pa3j

"The Indian ships are much bigger than ours. Their bases are made of three boards .. face formidable storms." See, R. H. Major, ed. (1857), "The travels of Niccolo Conti"

archive.org/stream/indiain…



The boards are very thick: 9 to 13 cm. Retained widths are usually between 30 and 50 cm, but some are up to 70 cm. The analysis shows that the boards are predominantly cedar wood and sometimes oak. The posts are acacia. The structural parts are made of wood imported from Mediterranean while the connecting pieces are common species in Egypt.

Catamarans built in Malabar coast compare with sewn boats of 19th cent. BCE Ain Sukhna, a Red sea port

Sewn boats of Kerala CEAlexandrie

Feb. 5, 2013 The technique of assembly by lashings is one of the world's oldest for constructing boats. It was in use in antiquity in egypt and in homeric greece. In the present day, this method is still used in the indian ocean, most notably in india itself, at kerala, where, nevertheless, the technique is unfortunately dying out. This film takes us to kerala on the malabar coast, and into a network of lakes and lagoons and canals known as the backwaters, where the last of these "sewn" boats are still employed. We shall follow the work of traditional carpenters who continue to practise this ancient technique and begin to understand its subtleties. Https://www.youtube.com/watch?v=xtpzpvprmr4 (26:00)

Mirror: http://tinyurl.com/hqbne2m

Ain Sukhna, (Arabic: العين السخنة *el-ʿĒn el-Soḳna)* archaeological explorations have shown an ancient pharaonic Red Sea port and settlement from which seafaring expeditions were organised.

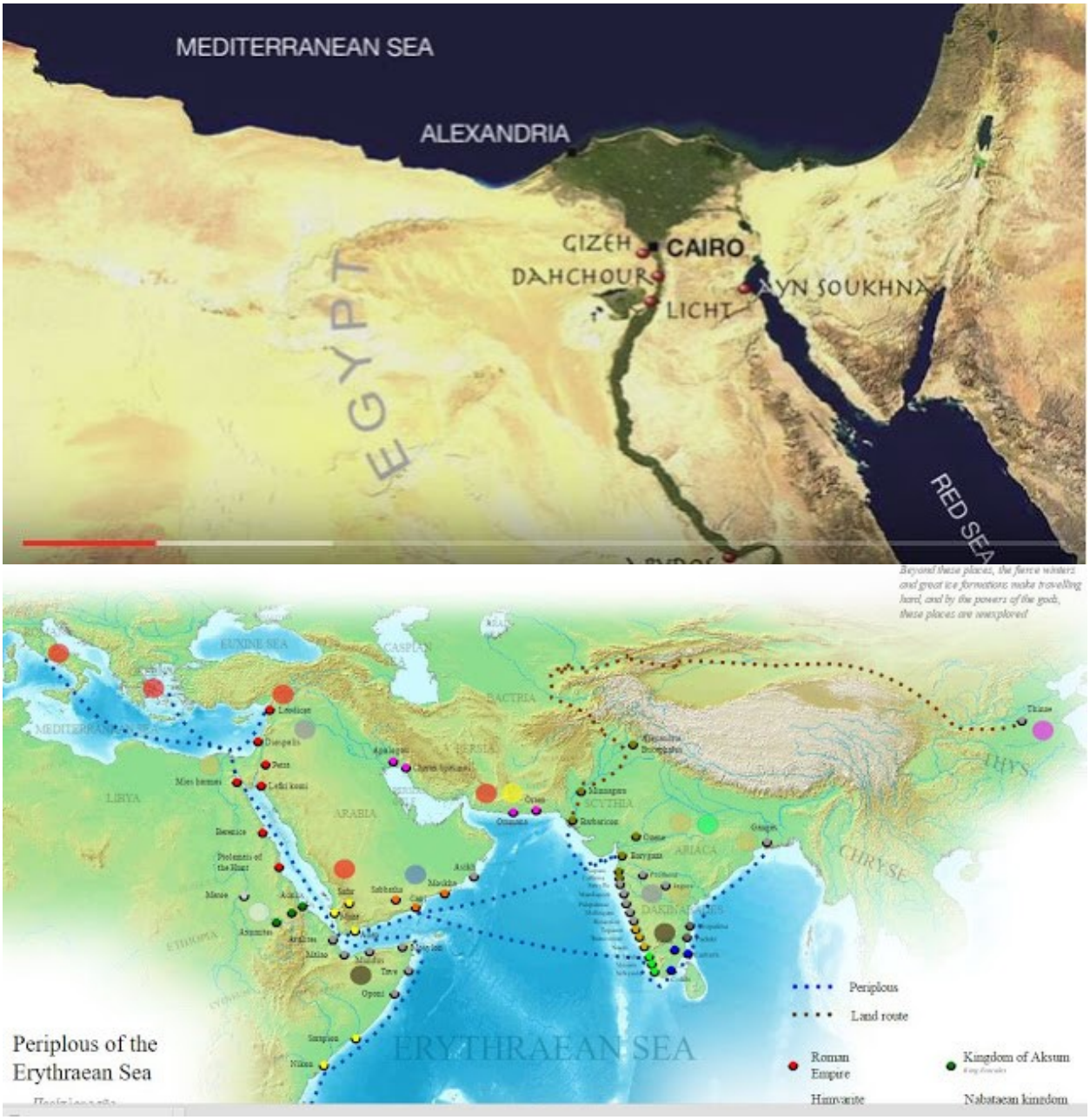
The sewn sailing boats discovered at this site dated to 19th cent. BCE based on a study of ceramic materials and dating of wood by radiocarbonne (14C).

Research is ongoing on the techniques used in making the sewn boats studying the techniques used even today in Malabar Coast of Kerala. Preliminry results indicate that the techniques used for making the Ain Sukhna boats and the present-day rafts called catamarans (lit. kaTTUmaram) of Kerala are comparable.

See: http://drs.nio.org/drs/bitstream/handle/2264/4029/Int_J_Naut_Archaeol_41_148a.pdf

Study of sewn plank built boats of Goa, India
http://www.persee.fr/doc/topoi_1161-9473_1993_num_3_2_1485 Lotika Varadarajan, 1993, Indian boat building traditions. The ethnological evidence, *Persee*, Vol.3, No.2, pp. 547-568.
http://somasiridevendra.navy.lk/assets/files/p_research.pdf Sean McGrail, Lucy Blue, Eric Kentley, Colin Palmer, *Boats of South Asia* Book Review 2004)

The hypothesis posited is that boat-builders from the West Coast of India had transferred the technology of building catamarans.



"The ***Periplus of the Erythraean Sea*** or ***Periplus of the Red Sea*** (Greek: Περίπλους τῆς Ἐρυθρᾶς Θαλάσσης, Latin: *Periplus Maris Erythraei*) is a Greco-Roman periplus, written in Greek (c. 1st-3rd cen.), describing navigation and trading opportunities from Roman Egyptian ports like Berenice along the coast of the Red Sea, and others along Northeast Africa and the Sindh and South western India...Many trade goods are mentioned in the *Periplus*, but some of the words naming trade goods are seen nowhere else in ancient literature, and so we can only guess as to what they might be. For example, one trade good

mentioned is *"lakkos chromatinos"*. The name *lakkos*appears nowhere else in ancient Greek or Roman literature. The name re-surfaces in late medieval Latin as *lacca*, borrowed from medieval Arabic *lakk* in turn borrowed from Sanskritic *lakh*, meaning lac i.e. a red-colored resin native to India used as a lacquer and used also as a red colorant. Some other named trade goods remain obscure." https://en.wikipedia.org/wiki/Periplus_of_the_Erythraean_Sea#

"Hatshepsut who came to the throne of Egypt in 1478 BCE had funded a mission to the Land of Punt.(which could be the horn of Africa close to Rann of Kutch). Five ships, each measuring 70 feet (21 m) long bearing several sails and accommodating 210 men that included sailors and 30 rowers. Many trade goods were bought in Punt, notably frankincense and myrrh."
https://en.wikipedia.org/wiki/Hatshepsut

Noting that several ships of 6th century Greece are sewn boats (assembly by lashings), Centre National de la Recherche Scientifique (The Centre d'etudes Alexandrines) has presented a splendid video on the techniques of making sewn boats in the Malabar coast of Kerala. These rafts are called கட்டுமரம் kaṭṭu-maram , *n*. < id. +. 1. **Catamaran**, used for deep sea fishing; raft made of logs of wood lashed or joined together; மீன்பிடிப்பதற்காக மரங்களாற் பிணைக்கப் பட்ட மிதவை. கோக்காமரம் kōkkā-maram is a seafaring raft: , *n*. prob. கோ- + கால்¹ +. *Loc*. 1. A kind of raft or **catamaran;** கடலிற்செலுத்தும் கட்டுமரவகைகளில் ஒன்று. *மேங்கா mēṅkā , n. A kind of* ***catamaran;*** *கடலில் ஓடும் கட்டுமரவகை. Loc.*


Ancient Polynesian catamaran (developed as early as 1500 BCE)


Catamaran, Tamil Nadu.

கடப்பா kaṭappā, n. perh. கட்டு- + பாய். Sail of a ***catamaran;*** *கட்டுமரத்திற் கட்டும் பாய். Loc.*

மடி³ maṭi Double **catamaran;** இரட்டைக் கட்டுமரம். (*G. T*n. *D. I*, 229.)

Hieroglyphs: 1. lathe; 2. body formed of two or more animals: G. *sãghāṛɔ* m. ‘ lathe ’; M. *sãgaḍ* f. ‘ a body formed of two or more fruits or animals or men &c. linked together, part of a turner's apparatus ’,*sa͂gāḍā* m. ‘ frame of a building ’, °*ḍī* f. ‘lathe’CDIAL 12859)

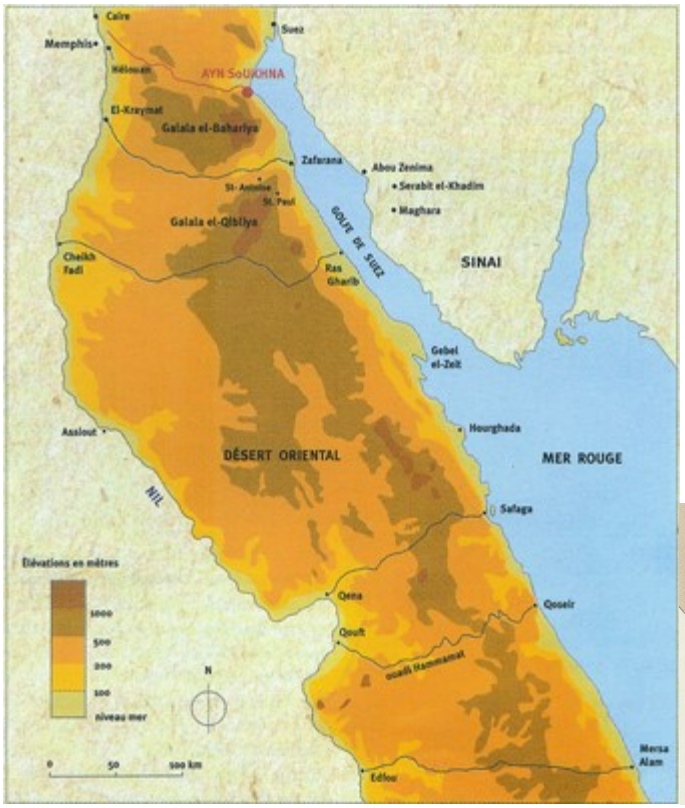
Double-canoe, raft: *saṁghāṭa* m. ‘ fitting and joining of timber ’ R. [√ghaṭ] Pa. *nāvā -- saṁghāṭa* -- , *dāru -- s*° ‘ raft ’; Pk. *saṁghāḍa* -- , °*ḍaga* -- m., °*ḍī* -- f. ‘ pair ’; M. *sãgaḍ* m.f. ‘ float made of two canoes joined together ’ (LM 417 compares saggarai at Limurike in the Periplus, Tam. *śaṅgaḍam*, Tu. *jaṅgala* ‘ double -- canoe ’), Si. *san ̆gaḷa* ‘ pair ’, *han ̆guḷa*, *an ̆g*° ‘ double **canoe**, raft ’ (CDIAL 12859)

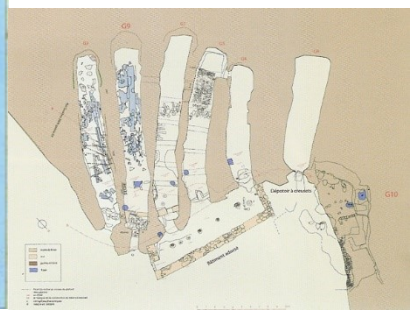
Boats of Ayn Sukhna

(French original and bibliography appended)

August 10, 2014 | by Francis Leveque | * Fr | wood | 2nd half of the third millennium BC. AD | Egypt (Upper Egypt) (Egypt)

The site of Ayn Sukhna on the Egyptian shores of the Gulf of Suez (70 km south of Suez) delivered archaeologists 2 vessels used in the Middle Kingdom. Ongoing excavations have been conducted since 2001 by a Franco-Egyptian team led by prof. Mahmoud Abd el-Zaziq (University of Suez), Dr. Georges Castel (IFAO) and prof. Pierre Tallet (University of Paris IV-Sorbonne).




The site

The site has many inscriptions evoking maritime expeditions in the Middle Kingdom by Mantouhotep Pharaohs (Eleventh Dynasty, the early twentieth century. BC.), Amenemhat II, Sesostris I, Amenemhet III (twelfth dynasty, first quarter the second millennium). Excavations have also revealed the seals of the fourth and fifth dynasties pharaohs, which traces the use of the site to the High Empire (middle of the third millennium).

The site consists of tunnels dug into the rock to serve as warehouses, buildings, copper ore processing plants. The galleries are located approximately 500 m from the shore. Among the 6 galleries, 3 of them the access is through a building built under the High Empire.

Two other (G2 and G9 galleries) are freely and still retained the dismantled wooden boats. They are about 20 meters long, 3 meters wide and 2 meters high. However the storage timber were burned and reduced to the state of charcoal (the ceiling collapsed during the fire, the fire was smothered and continued smoldering). The best preserved parts of the G2 gallery could be consolidated and removed to a laboratory study. But parts of the G9 gallery were studied in situ.

Woods

The planks were carefully arranged, superimposed on an unknown height but that exceeded 70 cm G9 gallery and isolated from soil by wedges. The whole was bound by ropes. Have been identified very long parts forming the shell and a thicker which served as a keel. Other pieces in the particular morphology formed the ends. However there is a lack of structural members, superstructure and rigging. Several hypotheses: either they do not exist or they were

on top and completely burned, or they are stored elsewhere in a still gallery to find.

The boards are very thick: 9 to 13 cm. Retained widths are usually between 30 and 50 cm, but some are up to 70 cm. The analysis shows that the boards are predominantly cedar wood and sometimes oak. The posts are acacia. The structural parts are made of wood imported from Mediterranean while the connecting pieces are common species in Egypt.

The boards retain their assemblies combining two complementary, not exclusive techniques:

- Like a system resembling strips of wood taking place in mortise. The posts 7 cm wide, 2 cm thick and the depth of the mortise can reach 15 cm.
- Cords of a ligating system passing loop in mortises L cut along the edges of the boards to be joined (0.5 cm diam.). There are a dozen cords by ligation.
Sometimes pins (diam. 2 to 3 cm) complete the above assemblies.
the anchors

Gallery 9 contained two large limestone anchors, weighing respectively 80 and 100 kg.

Restitution

Room dimensions and morphology corresponds to those of the Empire through the vessels found in the funeral of Sesostris III at

Dahshur complex. If we take these to model, it is then led to restore, as the volume of timber and distribution in galleries, boats of about 13.50 to 15 m long.

The region of destination of ships is probably located in the Sinai to Serabit El-Khadim where inscriptions confirm this, especially at a place called Rod el-Air. Rock carvings of boats which one can think that they are in direct contact with the remains of Ayn Sukhna show two types of vessels, both with a crescent-shaped hull and cabin but which are distinguished by their device steering (lateral or axial) and the cabin layout.

Dating

The study of ceramic materials and dating of wood by radiocarbonne (14C) indicate that the vessels were deposited in the late Middle Kingdom (late nineteenth century. BC.) Or at the beginning of the Second Intermediate period (early eighteenth century.). But the woods were in use during the Middle Kingdom and some parts date back to the end of the Old Kingdom (2500-2300 BC.). They should

therefore be subject to special attention which reflect the storage in the underground galleries.
Use, maintenance and destruction

The destination of these ships was probably the Sinai at a distance of about 100 km, to enjoy its metal resources (copper) and precious stones (turquoise). They had used regularly but not permanently so they were arranged between two expeditions.

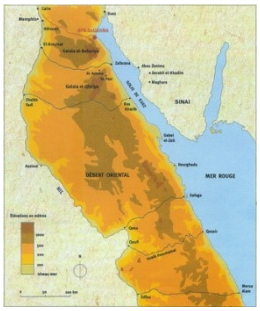
The long use of certain parts stored on shore shows that did not produce a new ship every shipment. The parts were carefully maintained. So do not imagine a royal workshop installed in the Nile valley constantly producing new parts for new boats. By cons, for several centuries one could replace parts alike; expertise was therefore never lost. Nothing says that the workshop was located so far from the place of use. No vestige does not prove the presence of an on-site workshop.

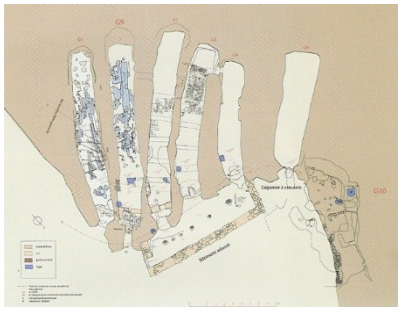
Why a fire broke out in two separate but adjacent galleries? It may be that a voluntary act of destruction intended to harm, by the interruption of shipments, on whom this advantage. Why then the site has he been used more? Have we completely stopped borrowing the sea or did you set up a different mode of travel, and in which locations?

Les bateaux à Ayn Sukhna

10 août 2014 | par Francis Leveque | *fr | bois | 2e moitié du IIIe millénaire av. J.-C. | Egypte (Haute Egypte) (Egypte)

Le site d'Ayn Sukhna sur les rives égyptiennes du golfe de Suez (70 km au sud de Suez) a livré aux archéologues 2 navires ayant servi au Moyen Empire. Les fouilles en cours sont menées depuis 2001 par une équipe franco-égyptienne sous la direction du prof. Mahmoud Abd el-Zaziq (université de Suez), du Dr. Georges Castel (IFAO) et du prof. Pierre Tallet (université de Paris IV-Sorbonne).





Le site

Le site comporte de nombreuses inscriptions évoquant des expéditions maritimes sous le Moyen Empire par les pharaons Mantouhotep (XIe dynastie, début du XXe s. av. J.-C.), Amenemhat II, Sesostris I, Amenemhat III (XIIe dynastie, premier quart du IIe millénaire). Les fouilles ont également révélé des sceaux de pharaons des IVe et Ve dynasties, ce qui fait remonter l'utilisation du site au Haut Empire (milieu du IIIe millénaire).

Le site se compose de galeries creusées dans la roche pour servir d'entrepôts, de bâtiments, d'ateliers de transformation du minerai de cuivre. Les galeries se trouvent à environ 500 m du rivage. Parmi les 6 galeries, l'accès de 3 d'entre elles se fait par un bâtiment construit sous le Haut Empire.

Deux autres (galeries G2 et G9) sont d'accès libre et conservaient encore les bois de bateaux démontés. Elles mesurent environ 20 m de longueur, 3 m de large et 2 m de haut. Cependant les bois entreposés ont été calcinés et réduits à l'état de charbon de bois (le plafond s'est effondré lors de l'incendie, le feu a été étouffé et il s'est poursuivi en combustion lente). Les pièces les mieux conservées de la galerie G2 ont pu être consolidées et enlevées pour une étude en laboratoire. Mais les pièces de la galerie G9 ont été étudiées *in situ*.

Les bois

Les planches ont été soigneusement rangées, superposées sur une hauteur inconnue mais qui dépassaient les 70 cm de la galerie G9 et

isolées du sol par des cales. Le tout était lié par des cordages. On a identifié des pièces très longues formant le bordé et une plus épaisse qui servait de quille. D'autres pièces à la morphologie particulière formaient les extrémités. En revanche on constate l'absence de pièces de charpente, de superstructure et de gréement. Plusieurs hypothèses : soit elles n'existaient pas, soit elles étaient sur le dessus et ont entièrement brulé, soit elles sont rangées ailleurs dans une galerie encore à trouver.


Les planches sont très épaisses : 9 à 13 cm. Les largeurs conservées sont le plus souvent comprises entre 30 et 50 cm, mais certaines mesurent jusqu'à 70 cm. L'analyse montre que les planches sont majoritairement en bois de cèdre et parfois en chêne. Les tenons sont en acacia. Les pièces de structures sont en bois importés de Méditerranée tandis que les pièces d'assemblage sont d'essences commune en Egypte.
Les planches conservent leurs assemblages alliant 2 techniques complémentaires et non exclusives :

- un système de tenons ressemblant à des languettes de bois prenant place dans des mortaises. Les tenons mesurent 7 cm de largeur, 2 cm d'épaisseur et la profondeur des mortaises peut atteindre 15 cm.
- un système de ligature de cordelettes (diam. 0.5 cm) passant en boucle dans des mortaises en L taillées le long des bords des planches à assembler. On compte une douzaine de cordelettes par ligature.

Parfois des chevilles (diam. 2 à 3 cm) viennent compléter les assemblages ci-dessus.

Les ancres

La galerie 9 contenait deux grosses ancres de calcaire, pesant respectivement 80 et 100 kg.

Restitution

Les dimensions des pièces et leur morphologie correspond à celles des bateaux du moyen Empire retrouvés dans le complexe funéraire de Sésostris III à Dahchour. Si on prend ces derniers pour modèle, on est alors conduit à restituer, selon le volume des bois et leur répartition dans les galeries, des bateaux d'environ 13,50 à 15 m de long.

La région de destination des navires est sans doute à situer dans le Sinaï, vers Serabit El-Khadim où des inscriptions le confirment, notamment au lieu-dit Rod el-Air. Des gravures rupestres d'embarcations dont on peut penser qu'elles sont en rapport direct avec les vestiges d'Ayn Sukhna montrent 2 types de navires, tous les deux avec une coque en forme de croissant et une cabine mais qui se distinguent par leur appareil de gouverne (latéral ou axial) et la disposition de la cabine.

Datation

L'étude du matériel céramique et les datations du bois par radiocarbonne (14C) indiquent que les navires ont été déposés à la fin du Moyen Empire (fin du XIXe s. av. J.-C.), voire au début de la Deuxième Période Intermédiaire (début du XVIIIe s.). Mais les bois étaient en usage pendant le Moyen Empire et certaines pièces remontent jusqu'à la fin de l'Ancien Empire (2500-2300 av. J.-C.). Ils devaient donc faire l'objet d'une attention particulière dont témoignent le rangement dans les galeries souterraines.

Usage, entretien et destruction

La destination de ces navires était sans doute le Sinaï à une distance d'environ 100 km, pour profiter de ses ressources métallifères (cuivre) et de pierres précieuses (turquoises). Ils ont dû servir régulièrement mais pas en permanence c'est pourquoi ils

étaient rangés entre deux expéditions.
Le long usage de certaines pièces stockées sur ce rivage montre qu'on ne fabriquait pas un navire neuf à chaque expédition. Les pièces étaient soigneusement entretenues. Il ne faut donc pas imaginer un atelier royal installé dans la vallée du Nil produisant en permanence des pièces nouvelles pour des bateaux neufs. Par contre, pendant plusieurs siècle on a pu remplacer des pièces à l'identique ; le savoir-faire n'a donc jamais été perdu. Rien ne dit que l'atelier ait été situé si loin du lieu d'usage. Aucun vestige ne prouve non plus la présence d'un atelier sur place.
Pourquoi un incendie s'est déclaré dans 2 galeries adjacentes mais bien séparées ? Il ne peut s'agir que d'un acte volontaire de destruction destiné à nuire, par l'interruption des expéditions, à celui à qui cela profitait. Pourquoi ensuite le site n'a-t-il plus été utilisé ? A-t-on cessé complètement d'emprunter cette voie maritime ou a-t-on mis en place un autre mode de déplacement, et dans quels lieux ?

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http://www.marine-antique.net/Les-bateaux-a-Ayn-Sukhna

https://www.youtube.com/watch?v=xtpZPvpRMr4 (26:00)
The Sewn Boats of Kerala

CEAlexandrie Published on Feb 5, 2013
"The technique of assembly by lashings is one of the world's oldest for constructing boats. It was in use in Antiquity in Egypt and in Homeric Greece. In the present day, this method is still used in the Indian Ocean, most notably in India itself, at Kerala, where, nevertheless, the technique is unfortunately dying out.
This film takes us to Kerala on the Malabar Coast, and into a network of lakes and lagoons and canals known as The Backwaters, where the last of these "sewn" boats are still employed. We shall follow the work of traditional carpenters who continue to practise this ancient technique and begin to understand its subtleties."

Asian maritime technology, Catamarans of Kerala

http://bharatkalyan97.blogspot.com/2016/07/catamarans-built-in-malabar-coast.html

Ain Sukhna, (Arabic: العين السخنة *el-ʿĒn el-Soḳna)* archaeological explorations have shown an ancient pharaonic Red Sea port and settlement from which seafaring expeditions were organised.

The sewn sailing boats discovered at this site dated to 19th cent.

BCE based on a study of ceramic materials and dating of wood by radiocarbonne (14C).

Research is ongoing on the techniques used in making the sewn boats studying the techniques used even today in Malabar Coast of Kerala. Preliminary results indicate that the techniques used for making the Ain Sukhna boats and the present-day rafts called catamarans (lit. kaTTUmaram) of Kerala are comparable.

See: http://drs.nio.org/drs/bitstream/handle/2264/4029/Int_J_Naut_Archaeol_41_148a.pdf

Asian maritime & trade chronology to 1700 CE

Abbreviated references in text; fuller references at foot of page. Some entries have precise dates, some have a range, and some are approximate - so the ordering is also subjective, but we have attempted to list events in rough chronological order, up to an arbitrary cutoff date of 1700 CE.

No such list can be definitive. Apart from many omissions, this selection reflects the interests of the compiler, with incompatible biases towards the early, the underdocumented, and the archaeologically or historically reliable, and specifically relating to maritime and trade history. Not all of this information is reliable - but a few decades ago, perhaps very little of the early history would have been believed by the cynical and Euro-centric, and archaeological discoveries since then have so often validated or exceeded legend that we are not inclined to be too dismissive. There is an extraordinary volume of documentary evidence in Asian and Middle Eastern languages not directly accessible to us. Also, the combination of snippets of varying quality, and from different cultures, may sometimes build up to an overall impression more convincing than the individual parts.

Sources are of very variable quality - sometimes tertiary or even more distant from the first hand accounts, but we have tended to include interesting assertions, using the best references to hand, and allow the reader to discriminate. The intention is to improve references over time, to the original documents or more reliable secondary sources - but we will retain multiple references, if potentially useful leads to books or internet content. All errors are

the fault of the compiler, Claire Barnes. Contributions and suggestions are welcome: please send them to info@maritimeasia.ws.

Names of **discovered shipwrecks** are highlighted in bold. Italicised names without quotation marks are the original names of the ships (e.g. ***Avondster***). Italicised names in quotation marks are reference names invented recently (e.g. ***'Turiang'***). Place names used to refer to wrecks are in bold but unitalicised (e.g. the **Hoi An** wreck), and are the names by which the specific wrecks are generally known (if other wrecks are found near Hoi An, they will doubtless be given other reference names). Events with date ranges are entered towards the later end of the range.

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c.33000-38000 BCE: Humans settled in Australia, after crossing open sea.
Peter Bellwood, 'Ancient seafarers', *Archaeology* Vol.50 No.2, Mar/Apr 1997, http://www.archaeology.org/9703/etc/specialreport.html.

c.6000-4000 BCE: Neolithic dugout boats and wooden paddles have been excavated at Hemudu and Xiaoshan in China's Zhejiang province. A Neolithic wooden oar and possible fragments of two boats dated up to 6000 BCE have been excavated in Changnyeong, South Korea. A wooden oar dated c.4000 BCE has been found in Japan. Neolithic maritime contact between Japan and the Korean peninsula has been mooted.
Hemudu boats & paddles - c.5000 BCE per Quanzhou museum caption; Xiaoshan boat - http://china.org.cn/english/culture/49406.htm; Korean & Japanese finds - http://www.physorg.com/news201274900.html.

3000-2000 BCE: Cowry shells (Cypraea moneta) were used for money in China's Gansu province (far inland).
Guangzhou museum caption.

c.2200 BCE: Australia, which had been isolated after the initial human settlement, received significant gene flow from India, coinciding with sudden changes in plant processing and stone tool technologies.
http://www.mpg.de/6818105/Holocene-gene-flow_India-Australia

Xia dynasty - c.2000 BCE: Multi-planked boats were developed in China.

Quanzhou museum caption.
C11th BCE: After collapse of the Shang dynasty, Chinese general You Houxi led 250,000 troops to the South Pacific and the Americas. Quanzhou museum caption.
'A Link Between Chinese and American Cultures? The Olmec and the Shang', *Sinorama* magazine, Vol. 22 no.5 May 1997, http://www.sinorama.com.tw/en/8605/605006e1.html, mirrored at http://www.taiwaninfo.org/info/sinorama/en/8605/605006e1.html; article with examples of similar characters http://abcnews.go.com/ABC2000/abc2000science/neww orld991019.html; *The Olmecs and the Shang*: a summary of the artistic evidence: http://members.tripod.com/~kon_artz/cultures/olmshang .htm; at around the same time the Chavin of Peru started making bronze jaguars similar to Shang bronze tigers: Louise Levathes, *When China ruled the seas*, p.28, citing Garry Tee, 'Evidence of the Chinese origin of the jaguar motif in Chavin art', *Asian Perspectives* 21:1 (1978), 27-29; summary of legends and theories about early contacts of Chinese and other explorers with America by the Northern Archaeology Group (UK): http://www.n-a-g.freeserve.co.uk/DOCUMENTS/ISS14_11JAN2000/ISS14_11JAN20 00.htm; another summary http://hussle.harvard.edu/~zhang/docs/Pre-Columbian%20Contact.pdf
C10th BCE: King Solomon of Israel and King Hiram of Tyre sent ships from Ezion-geber on the Red Sea (near Eilat/Aqaba) to Ophir (probably in India). Every three years the ships brought gold, silver, precious stones, almug trees (sandalwood), ivory, apes, and peacocks.
The Bible, I.Kings, 9:26-28; 10:11; and 10:22
1200 - 900 BCE: Obsidian tools found at Bukit Tengkorak in Sabah may have originated in Papua New Guinea, 3500km away.
Stephen Chia, *The obsidian industry at Bukit Tengkorak, Sabah, Malaysia*, Universiti Sains Malaysia, 2005, http://eprints.usm.my/7396/1/The_obsidian_industry_at_Buk it_Tengkorak_Sabah_Malaysia.pdf; Stephen Chia, 'Prehistoric sites and research in Semporna, Sabah, Malaysia', *Bulletin of the Society*

for East Asian Archaeology Vol.2 (2008). ISSN 1864-6018, http://www.seaa-web.org/bulletin2008/bul-essay-08-01.htm
947-858 BCE: Cowry shells were still in use in the middle of the Western Zhou dynasty; they have been excavated at Rujiazhuang, Baoji (west of Xi'an - slightly coastwards from Gansu).
Shaanxi Provincial Museum, Xi'an, artefacts and captions
549 BCE: Various vessels had been developed for battles on inland waters in the Chinese states of Wu and Chu. One type was 24 metres long and carried 91 people, including 50 oarsmen, 26 soldiers, 4 men with long lances or similar weapons, 2 officers, etc.
Tang Zhiba, 'The influence of the sail on the development of the ancient navy', p.60 - citing Yuan Kang, '*Yue Jue Shu*' ('Lost records of the State of Yue') [in Chinese, East Han dynasty].
547-490 BCE: 'Qi Jinggong, king of Qi [on the coast of Shandong province] in 547-490 BCE, had a joyful tour at sea for six months.'
Ma Xiangyong, 'Xu Fu, one of the navigation forerunners in the world', p.185, quoting 'Talk of Tortuosity, Remonstrant Piece' [in Chinese, Han dynasty].
485 BCE: Fu Chai, king of Wu, commanded his navy 'to fight Qi from the sea and was defeated in the battle'.
Ma Xiangyong, 'Xu Fu, one of the navigation forerunners in the world', p.185.
425 BCE: Babylonians sailed to the South China Sea. Meanwhile, Chinese silk was sent to Greece by sea.
G'zhou Mar.Silk Rd 2001, p.17
C4th BCE: A lodestone compass was mentioned in the Chinese *Book of the Devil Valley Master*, 'they carry a south-pointer with them so as not to lose their way'.
Robert Temple, *The Genius of China* (from Needham), p.151
356-321 BCE: The Periplus (pilot book) of Niarchus, an officer of Alexander the Great, describes the Persian coast. Niarchus commissioned thirty oared galleys to transport the troops of Alexander the Great from northwest India back to Mesopotamia, via the Persian Gulf and the Tigris, an established commercial route.
Kenneth Hall, *Maritime trade and state development in early Southeast Asia*,
p.28; http://lrrc3.plc.upenn.edu/indianocean/group5/penny01.html
Alexander's officer Onesicrities sailed southwards, and later descriptions of the voyage mention Taprobane (Sri Lanka).

A. Denis N.
Fernando, http://www.island.lk/2001/12/12/midwee03.html;
334-323 BCE: Eratosthenes, the librarian at Alexandria, drew a map which includes Sri Lanka and the mouth of the Ganges.
http://ias.berkeley.edu/orias/spice/textobjects/moreonmaps.htm
321-297 BCE: The Mauryan emperor Chandragupta established a naval bureaucracy with a charter.
http://jigyasa0.tripod.com/trade.html, citing Kautilya's Arthasastra; http://indiannavy.nic.in/maritime_history.htm
pre-Qin [-221 BCE]: the Southern Yue people, in the vicinity of Guangzhou, sourced goods such as rhinoceros horns, ivory and jewels through maritime trade. By the time of the Nanyue kingdom (203-111 BCE), Guangzhou was an established trade centre.
G'zhou Mar.Silk Rd 2001, p.28
210 BCE: The first emperor of China, Qin Shihuangdi, toured Eastern China by ship, both on rivers and along the coast. He also despatched Xu Fu to sail overseas in search of elixirs of immortality, accompanied by 3,000 virgin boys and girls, and large amounts of grain, materials, workers and guards. The emperor died later that year. History is entangled in legend; Xu Fu may have settled in Japan, with significant cultural implications, and may have become the first Japanese emperor.
Ma Xiangyong, 'Xu Fu, one of the navigation forerunners in the world, citing Si Maqian, '*Shi Ji*' (Historical record) [in Chinese, Han dynasty] on the departure of Xu Fu.
late C3rd BCE: Arikamedu on the Coromandel coast of India had trade contact with the Mediterranean.
S.Suresh, *Arikamedu: its place in the Ancient Rome - India contacts*, as reviewed by Sila Tripati: http://drs.nio.org/drs/bitstream/2264/2590/1/Man_Environ_33_%20113.pdf

Qin dynasty [221-207 BCE]: A shipyard site found at Zhongshansilu in Guangzhou, with Qin coins among the artefacts, is estimated to have built ships carrying 25-30 tons.
Maritime Silk Route 1996, p.41, 46-47.


Plan of the Qin dynasty shipyard site in Guangzhou

183 BCE: Han regime imposed trade sanctions and blocked the supply of iron to Nanyue.
Museum of the Nanyue king, 1999, p.133
122 BCE: King Zhao Mo of Nanyue died. His tomb in Guangzhou contains African ivory, and a silver box from Persia.
Museum of the Nanyue king, 1999, p.10.
118 BCE: Ptolemy VIII appointed Eudoxus of Cyzicus to lead a voyage from Egypt to India, guided by an Indian who had been shipwrecked in Egypt. Eudoxus returned with perfumes and precious stones. On a second voyage, Eudoxus was himself blown off course to Ethiopia, where he found the wreck of a ship which he thought to have come from Gades (Cadiz) by circumnavigating Africa. He later sailed from Gades down the west coast of Africa in an attempt to repeat the journey, but was forced to give up. On the voyages of Eudoxus or shortly afterwards (by 90BCE), a Greek named Hippalus started to sail to India with the monsoon winds and the open sea, rather than coast-hugging. Between 110 and 51BC, four Egyptian inscriptions mention Ptolemaic officers 'in charge of the Red and Indian seas'.
George Hourani, *Arab seafaring*, p.24-28; Strabo's Geography II:3.4, http://penelope.uchicago.edu/Thayer/E/Roman/Texts/Strabo/2C*.html#3.4; http://en.wikipedia.org/wiki/Eudoxus_of_Cyzicus
113 BCE: The Han emperor Wudi sent a fleet with 100,000 soldiers to suppress a rebellion in Guangzhou.
Tang Zhiba, 'The influence of the sail on the development of the ancient navy', p.61 - citing Ban Gu, '*Han Shu*' ('History of the Han dynasty'), the life of Emperor Wudi [in Chinese, East Han dynasty].
111 BCE: Wudi, who had already conquered Zhejiang and Fujian and moved their inhabitants inland, defeated and divided the Nanyue kingdom (which had covered modern Guangdong, Guanxi, and north Vietnam).
Ann Paludan, *Chronicle of the Chinese emperors*, p37.
Emperor Wudi sent envoys to Southeast Asia and the Persian Gulf (as well as overland through Central Asia); the seafarers returned with coral from West Asia, plus tortoiseshell and rhinoceros horn.
captions in G'zhou Museum Annex, Feb 2002; rhino horn and tortoise or turtle shell from these expeditions were on display.

C1st BCE: A blue glass bowl excavated in a Han tomb in Guangzhou

is probably Roman, made on the southern shores of the Mediterranean in the C1st BCE.
Maritime Silk Route 1996, p.69
The Chinese were impressed by Roman glass, and started to import not just finished items but technology and possibly raw materials for sodium-calcium glassware. Import dependence was unsatisfactory, and the south coast glass industry waned. Even the knowhow was eventually lost, but a separate glass industry later developed in the north, with assistance from India during the reign of Wei emperor Shizu (424-452 CE).
Shen Fuwei, *Cultural flow between China and the outside world*, p.116-120, citing the C3rd *Guang Zhi* on the maritime 'glass route' from Rome via India, Sri Lanka and Cambodia to China, *The Periplus of the Erythraean Sea* on the export of 'crude glass' to the East, and *Wei Shu* (*History of the Wei dynasty*) on the Indian technology transfer to Pingcheng (Datong).
Official relations were established between Japan and Han China, after the establishment of the Han's Lelung Jun command nearPyongyang in 108 BCE.
Fukuoka City Museum caption.
24 BCE: Augustus Caesar sent an army to capture Aden. Thereafter, the Romans opened sea routes to India, where they could buy Chinese silk, bypassing war-torn areas and diminishing the role of Persians and Arabs who previously dominated the trade. An Indian delegation had visited Augustus in 25 BCE (and another in 21 BCE).
Shen Fuwei, *Cultural flow between China and the outside world*, p.42; http://nabataea.net/redsea.html;
Indian delegations: Kenneth Hall, *Maritime trade and state development in early Southeast Asia*, p.33, citing R.E.M. Wheeler, 'Arikamedu: an Indo-Roman trading station on the east coast of India', *Ancient India* 2 (1946): 19.
1-6 CE: During the reign of [boy emperor] Pingdi, Chinese officials were sent to several South Asian countries to 'spread the power and virtue' of the Han Emperor and search for precious objects.
Prof W.I.
Siriweera, http://lakdiva.net/coins/media/cdn_1998.06.21_china_trade.htm
2 CE: A rhinoceros was offered to the Chinese emperor by Huangzhi, identified as Kanchipura (Conjeveram) in southeast India.

Yoshiaki Ishizawa, 'Chinese chronicles of C1st-5th century AD Funan', p.11, citing *Hanshu* vol.2 *Pingdiji*.
early C1st CE: Strabo described the expansion of Asian trade under the Roman emperor Augustus (27BCE-14CE); previously 20 ships a year passed from the Red Sea into the Indian ocean; now ships were departing in convoys of 120 from the upper Red Sea port of Myos Hormos alone.
Kenneth Hall, *Maritime trade and state development in early Southeast Asia*, p.28-29, citing Horace Jones, transl, *The Geography of Strabo*, Cambridge, 1949, 2.5.12, 17.1.13.
23 CE: Chinese emperor Wang Mang died, after amassing a vast percentage of the world's gold reserves - which caused disruption in Rome, where emperor Tiberius banned the wearing of silk.
Ann Paludan, *Chronicle of the Chinese emperors*, p43. Tiberius is deemed to have been worried about the trade deficit and the outflow of hard currency.
C1st CE: C1st cloth, peppercorns and coconuts from India have been found at the Roman port of Berenike in Egypt, along with undated beads from Southeast Asia, and teak from India or Burma which may be recycled ships' timbers.
http://popular-science.net/history/india_egypt_trade_route.html; http://www.ling.upenn.edu/~jason2/papers/bnikeppr.htmRoman coin finds in India are predominantly in the south and suggest the use of an overland route from the Malabar to the Coromandel coast. The coins all have gold or silver content, and are predominantly from the reigns of Augustus and Tiberius (14-37 CE) - the two sound-money emperors. Fewer ships sailed around south India, but C1st Roman coins were found at Kadmat in the Lakshadweep islands.
Kenneth Hall, *Maritime trade and state development in early Southeast Asia*, p.34-36, citing R.E.M. Wheeler, *Rome beyond the imperial frontiers*, London, 1954, p.138-145; Tripati & Gudigar, 'Shipwreck archaeology of the Lakshadweep Islands', IJNA (2001) 30.1, p.38
Roman amphorae and other artefacts found at Pattanam in Kerala may represent the trading port of Muziris, which flourished C1st BCE toC5th CE.
http://www.indolink.com/displayArticleS.php?id=042104091359
Arikamedu near Pondicherry in southeast India was a thriving port,

peaking in 23-96 CE (the Roman trade between 30 & 50 CE), and a permanent base for western merchants known in Indian literature as *yavana*. Excavations show trade in pepper, pearls, gems, muslins, tortoise shell, ivory and silk; and from the west coral, lead, tin, glass, vases, lamps, wine and coins.
Kenneth Hall, *Maritime trade and state development in early Southeast Asia*, p.28, citing R.E.M. Wheeler, 'Arikamedu: an Indo-Roman trading station on the east coast of India', *Ancient India* 2 (1946) 17-124, and M.P.Charlesworth, 'Roman trade with India, a resurvey', in *Studies in Roman economic and social history in honour of Allen Chester Johnson*, ed. P.R.Coleman-Norton, 131-143.
Tamil literature describes Kaverippumppattinam as an important trade port on the Coromandel coast with a huge warehouse; the king's tiger emblem was stamped on incoming and outgoing goods to certify payment of duty.
Kenneth Hall, *Maritime trade and state development in early Southeast Asia*, p.34, citing *Pattinapalai*, a Sangam poem of the first centuries AD, quoted in K.V. Subrahmanya Aiyer, 'Largest provincial organisations in ancient India', *Quarterly Journal of the Mythic Society* 65, 1 (1954-55): 38.
c.45 CE: Buddhist monks from Sri Lanka visited Emperor Claudius in Rome. Trade subsequently improved.
Susanne Loos-Jayawickrema / Sunday Times, http://www.is.lk/times/010930/plusm.html
52 CE: The Roman chronicler Pliny complained about India's trade surplus. He also described a kingdom in the south of Sri Lanka, probably Tissamaharama.
India: Pliny, Natural History 6.96-111 e-text http://www.fordham.edu/halsall/ancient/pliny-india.html; trade balance http://jigyasa0.tripod.com/trade.html; A. Denis N. Fernando, http://www.island.lk/2001/12/12/midwee03.html (Fernando says Pliny visited Sri Lanka personally); Kenneth Hall, *Maritime trade and state development in early Southeast Asia*, p.29, citing H. Rackham, *The natural history of Pliny the Elder*, Cambridge, 1960, 6.26, 6.1 (Hall says Pliny's info on Sri Lanka was based on the envoys' visit to Claudius).
54-68 CE: The Roman emperor Nero debased the currency, which rapidly became unacceptable. Few Roman coins are found in India from Nero's reign onwards. Indian traders started to take more

interest in opportunities to the east.
Kenneth Hall, *Maritime trade and state development in early Southeast Asia*, p.36, citing R.E.M. Wheeler, *Rome beyond the imperial frontiers*, London, 1954, p.140-141.
57 CE: The king of Na Koku in Japan sent an envoy to Han China, and was presented with a gold seal.
Fukuoka City Museum caption.
C1st CE: The Periplus of the Erythraean Sea, written by a Greek, describes trade in the Red Sea and Indian Ocean, including the harbours of Sri Lanka and the west coast of India, the customs regime imposed by Rome in the Red Sea, and the difficult possibility of reaching China by sea (China had been known to Greeks since the C5th BCE, but the land route was better known). It also describes the flourishing trade through Adulis, the Red Sea port of the Aksumite civilisation in Ethiopia, which flourished C1st-7th.
Kenneth Hall, *Maritime trade and state development in early Southeast Asia*, p.29-34, citing W. Schoff's translation of *The Periplus*, New York, 1912, and dating it to 40-75AD; background http://lrrc3.plc.upenn.edu/indianocean/group5/penny01.html; e-text http://www.fordham.edu/halsall/ancient/periplus.html; Aksum summary http://www.metmuseum.org/toah/hd/aksu/hd_aksu_1.htm; Stuart Munro Hay, *Aksum: an African civilisation of late antiquity*, ch.8-4, http://users.vnet.net/alight/aksum/mhak3.html#c8-4.
97 CE: A Chinese envoy reached Parthia (northern Iran) and reported on comparative costs and control of land and sea routes.
http://depts.washington.edu/uwch/silkroad/exhibit/rome/rome.html
116 CE: The Babylonian port of Spasinou-Chirax, near Basra, was an important port for traders carrying Asian luxury goods to the Mediterranean world during the C1st BCE and first two centuries CE. The Roman emperor Trajan visited in 116CE, saw the great ships setting sail for India, and wished he were young enough to go himself.
http://depts.washington.edu/uwch/silkroad/texts/hhshu/notes10.html, citing Sitwell (1984) p.107-9.
125 CE: The Chinese thought the profits on trade from 'Ta'chin' (Roman territories in the Middle East, from Syria to Egypt) to

Northwest India were tenfold but honest. Ta'chin products reaching China included glassware, including glass jewellery and ornaments, carpets, embroideries and precious stones.
Kenneth Hall, *Maritime trade and state development in early Southeast Asia*, p.36, citing *Hou Han-shu* (History of the former Han), quoted in O.W. Wolters, *Early Indonesian Commerce: a study of the origins of Sri Vijaya*, Ithaca, 1967, p.40.
131 CE: The king of Anuradhapura (Sri Lanka) sent a diplomatic mission to China. Twelve more were recorded between the 5th and 10th centuries.
Prof W.I.
Siriweera, http://lakdiva.net/coins/media/cdn_1998.06.21_china_trade.htm
113-135 CE: King Gajabahu I of Ruhuna in the south of Sri Lanka granted to a local temple the customs duties from the port of **Godavaya**. A shipwreck found offshore has been tentatively dated to the C4th or earlier. Ceramics from Persia and China, and Roman coins, are found at Godavaya. Garnets found in many European graves of C2nd-7th were sourced from India and Sri Lanka, and are found in the river at Godavaya.
http://www.archaeology.lk/maritime-archaeology/godawaya-an-ancient-port-city-2nd-century-ce-and-the-recent-discovery-of-the-unknown-wooden-wreck/, http://www.tamilnet.com/art.html?catid=79&artid=32626, http://www.lankalibrary.com/geo/godavaya.htm
c.150 CE: The *Geographia* of Ptolemy, who was based in Alexandria, includes details of places in Sri Lanka, India (incl. Coromandel coast) and Southeast Asia.
Peter Francis, Roman maps & Indian gems: http://www.thebeadsite.com/UNI-MAPS.html; A. Denis N. Fernando, http://www.island.lk/2001/12/12/midwee03.html; background http://lrrc3.plc.upenn.edu/indianocean/group5/penny02.html; Kenneth Hall, *Maritime trade and state development in early Southeast Asia*, p.29 & 104, citing G.E. Gerini, *Researches on Ptolemy's Geography of Eastern Asia*, London, 1909, & W.J. Van der Meulen, SJ, 'Ptolemy's geography of mainland Southeast Asia and Borneo', *Indonesia* 19 (April 1975): 16-22. Stuart Munro-Hay notes (*Nakhon Sri Thammarat*, p.11) that Ptolemy's comments were probably amplified subsequently, and that the text now attributed to

him may not predate the earliest copies, C10-11th.
166 CE: Purported envoys of the Roman emperor Marcus Aurelius arrived in China by sea. They came from Rinan in central Vietnam, landed at Guangzhou, and proceeded to Luoyang, where they presented ivory, rhinoceros horn and hawksbill turtle to the Chinese emperor. The court thought the gifts ordinary, but agreed that the two great powers should establish official diplomatic and trading relations.
Shen Fuwei, *Cultural flow between China and the outside world*, p.43, citing the *History of the later Han dynasty*; also G'zhou Mar.Silk Rd 2001, p.28,
and http://depts.washington.edu/uwch/silkroad/exhibit/rome/rome.html; some sources doubt the diplomatic credentials.A gold medallion of Marcus Aurelius' predecessor Antoninus Pius dated 152 CE has been unearthed at Oc Eo, the main port of Funan in southern Vietnam, which flourished between the 1st and 6th centuries - especially after strife disrupted caravans across central Asia in the C2nd-3rd. The alternative land-sea route involved maritime sections from the Middle East to northwest India, across the Bay of Bengal to the Isthmus of Kra, across the Gulf of Thailand to Funan, and from Funan to China. Other C2nd-3rd finds at Oc Eo include Roman coins, Indian seals, and jewellery. At around the same time, a commercial centre developed at Ko-ying in the Sunda Straits; Malay seamen brought spices and forest products to Funan.
Funan & Antoninus medallion: David Chandler, *A history of Cambodia*, p.14, & Kenneth Hall, *Maritime trade and state development in early Southeast Asia*, p.59, both citing Louis Malleret, *L'archéologie du delta de Mekong*, 4.vols (Paris 1959-63) - vol 3, *La culture du Fou-nan*,
1962; http://instruct1.cit.cornell.edu/courses/hist190/SEA%20P&P%201.html; Land-sea route and Ko-ying: Kenneth Hall, *Maritime trade and state development in early Southeast Asia*, p.20-21, citing O.W. Wolters, *Early Indonesian Commerce: a study of the origins of Sri Vijaya*, Ithaca, 1967. Funan and Ko-ying are the Chinese names.
C2nd CE: Romans reached Yunnan from Burma via the Irrawaddy river, after travelling by sea from Arabia.
Shen Fuwei, *Cultural flow between China and the outside world*, p.42.
200 BCE - 200 CE: Trade pottery from Arikamedu in India reached

Sembiran in Bali.
Ardika & Bellwood, 'Sembiran and the first Indian contacts with Bali', *Antiquity*, Mar 1997, http://findarticles.com/p/articles/mi_hb3284/is_n271_v71/ai_n28685066/
Han dynasty [206 BCE-220 CE]: Chinese shipbuilding innovations included iron nails, putty caulking, bamboo battens for sails, and the rudder.
Tang Zhiba, 'The influence of the sail on the development of the ancient navy', p.61 - citing Xi Longfei & Yang Xi, *The history of the development of Chinese shipbuilding*, The Wuhan Institute of Water Transport Engineering, 1985 [in Chinese].
The rudder had been invented in China in the C1st BCE; it spread to the Arab world in C10th CE, and to Europe in the C12th.
During the Han dynasty, ships from Fujian province sailed to Jiaozi [Vietnam].
Quanzhou maritime museum captions. Rudders are shown on several ship models found in Han tombs in Guangzhou, see eg *Maritime Silk Route*, 1996, p.64.
During the Han dynasty, occupied Vietnam (Chaio Chih) received ships travelling to China from Java, Burma, Iran and the Roman empire. Khmers and Indians were living in major centres. Overseas trade was controlled by the Chinese.
Nguyen Khac Vien, *Vietnam: a long history*, p..24-25.A Han dynasty dragon bowl excavated in Indonesia is strikingly similar to one excavated in Guangzhou.
Maritime Silk Route 1996, p.69Exchanges of envoys between China and the Roman empire are recorded in the *Hou Han Shu* (history of the later Han dynasty).
Maritime Silk Route 1996, p.67
223 CE: A fleet of Wu warships were lost in a storm in the Yellow Sea, while at war with Lu (now Shandong).
Liu Pean, 'Viewing Chinese ancient navigation and shipbuilding through Zheng He's ocean expeditions', p.177
226 CE: Merchants from Roman Asia Minor visited the Wu court; emperor Sun Quan questioned them personally and sent an official to escort them on their return voyage.
Kenneth Hall, *Maritime trade and state development in early Southeast Asia*, p.38, citing O.W. Wolters, *Early Indonesian*

Commerce: a study of the origins of Sri Vijaya, Ithaca, 1967, p.42.
240 CE: The Wu emperor Sun Quan [Wu Wudi] sent ambassadors Zhu Ying and Kang Tai to the 'nations of the south seas' [Funan and Southeast Asia]. The book '*Strange things from the south*' reports the prosperity of Funan, its control of trade routes through vassal states in what is now Thailand and the Malay peninsula, and four-masted ships with sails set obliquely and woven from 10-foot leaves of the lu-tou tree.
Xin Yuanou & Yuan Suishan, 'The blue ribbon holder in the medieval age', p.66 - citing Wan Zhen, '*Nan Zhou Yi Wu Zhi*' (Strange things from the South);
Kenneth Hall, *Maritime trade and state development in early Southeast Asia*, p.38, citing Wang Gungwu, 'The Nanhai trade: a study of the early history of Chinese trade in the South China Sea', *JMBRAS* 31, 2 (1958): 33, p.48 & 64-68 citing Paul Wheatley, *The Golden Khersonese, studies in the historical geography of the Malay peninsula before 1500*, Kuala Lumpur, 1961, and other secondary sources;Yoshiaki Ishizawa, 'Chinese chronicles of C1st-5th century AD Funan', p.13, reckons the date of despatch to be 228AD.Kang Tai reported that a large ship could carry about a hundred passengers and needed 40-50 oarsmen. Wan Zhen, writing in the same Wu period, reported that a large foreign ship (from Funan?) was over 20 *jo* (48m) long and 2-3 *jo* (5-7m) above the water, and carried 6-700 passengers.
Yoshiaki Ishizawa, 'Chinese chronicles of C1st-5th century AD Funan', p.16, citing Wan Zhen, *Nanzhou yuwuzhi*.
281 CE: Roman envoys visited Luoyang via Guangzhou. A Buddhist monk from India arrived in Guangzhou and founded the Sangui and Wangren temples.
G'zhou Mar.Silk Rd 2001, p.28.
C3rd: The Sacred Bodhi tree of Buddha Gaya was brought to Sri Lanka through the port of Jambukola.
Rohan Jayatilleke, http://origin.sundayobserver.lk/2001/08/19/fea20.html
C3rd: Multi-masted ships were introduced in China by C3rd CE; possibly in the C1st.
Xin Yuanou & Yuan Suishan, 'The blue ribbon holder in the medieval age', p..66.
c.300 CE: Japan was trading actively with Korea.

K.Nomoto & K.Ishii, 'A historical review on ships of Japanese tradition', p.97
306 CE: The Indian monk Jiva was the first of many Buddhist monks to arrive at Guangzhou by sea.
Maritime Silk Route 1996, p.59
320CE: Date of the earliest excavated **Butuan boat** (others date from 990 & 1250CE): large open-water boats found at Butuan in Mindanao, Philippines.
National Museum of the Filipino People, display & caption; http://members.tripod.com/philmuseum/archaeo.htm; Green, Vosmer et al http://www.museum.wa.gov.au/collections/maritime/march/documents/No.%20064%20PhilippinesReport.pdf
345 CE: Four hundred Syrian Christians arrived in Kerala (SW India), led by Thomas of Cana. Stories of the arrival of St Thomas the Apostle in 52CE are now questioned. Traditions also vary on the arrival date of Kerala's Jews, from Nebuchadnezzar's occupation of Jerusalem in 587 BCE to C4th CE.
Ishwar Sharan, http://hamsa.org/05.htm; http://www.kerala.cc/keralahistory/index2.htm; http://www.kerala.cc/keralahistory/index36.htm; http://www.shelterbelt.com/KJ/khjews.html
414 CE: The Chinese monk Fa Xian returned home from India by sea, after visiting Sri Lanka.
A Record of Buddhist Kingdoms, Fa-Xian/Legge, p100; see www.maritimeasia.ws/topic/Malaysia_crossroads.html#FaXian for description of sea journey, http://faculty.washington.edu/dwaugh/CA/texts/faxian.html for his prior travels on land, and http://www.lankalibrary.com/geo/ancient/trade.htm for his vist to Anuradhapura.
383-484 CE: Persian coins of the Sassanian dynasty have been excavated at various places in Guangdong province, and are assumed to result from maritime trade.
Maritime Silk Route 1996, p.72.
Late C4th - early C5th: Most east-west traffic started to go through the Straits of Malacca, instead of overland at the Isthmus of Kra, leading to the rise of Srivijaya in southeastern Sumatra. Srivijaya became a Chinese trade partner, controlled piracy, and dominated

the Straits for over 500 years.
Kenneth Hall, *Maritime trade and state development in early Southeast Asia*, p.20-23 & 26, citing O.W. Wolters, *Early Indonesian Commerce: a study of the origins of Sri Vijaya*, Ithaca, 1967.
C 4-5th: Coin from Aksum (Ethiopia) found at Mahagama in Sri Lanka.
Susanne Loos-Jayawickrema / Sunday Times, http://www.is.lk/times/010930/plusm.html
422 CE: The Indian prince and Buddhist monk Gunavarman arrived in Java; he stayed for several years before continuing to China, and missed an expected stop in Champa due to unfavourable winds.
Kenneth Hall, *Maritime trade and state development in early Southeast Asia*, p.40 & 104, citing George Coedès, *The Indianized states of Southeast Asia*, ed. Walter F.Vella, trans. Susan Brown Cowing, Honolulu 1968, p.54 & O.W. Wolters, *Early Indonesian Commerce: a study of the origins of Sri Vijaya*, Ithaca, 1967, p.35.
428 CE: Sri Lankan king Mahanamo sent a jade Buddha statue to the Chinese emperor.
http://www.lankalibrary.com/geo/ancient/trade.htm.
431 CE: The Cham kingdom of Lin-yi assembled over a hundred ships to pillage the north Vietnamese coast.
Kenneth Hall, *Maritime trade and state development in early Southeast Asia*, p.74-5, citing George Coedès, *The Indianized states of Southeast Asia*, ed. Walter F.Vella, trans. Susan Brown Cowing, Honolulu 1968, p.56-7.
430-452 CE: The ruler of Ho-lo-tan in NW Java sent seven missions to the Chinese court.
Kenneth Hall, *Maritime trade and state development in early Southeast Asia*, p.104, citing the *Liu Sung shu* [history of the early Sung] composed 470-478, per O.W. Wolters, *Early Indonesian Commerce: a study of the origins of Sri Vijaya*, Ithaca, 1967: 151, 313 nn. 92, 95
mid-C5th: The people of Funan were said to charter ships to go both east and west, far and near; shipowners were paid only if on schedule.
Yoshiaki Ishizawa, 'Chinese chronicles of C1st-5th century AD Funan', p.16, citing *Yiyuan*.
467 CE: The Buddhist monk Hui-Shen and his Afghan companions travelled from China to Fu-Sang, which some interpret merely as

Japan, and others as the west coast of North America, perhaps Mexico. Mayan art at this time develops features suggesting Hindu and Buddhist influence. Hui Shen returned to China in 499, and reported to emperor Wu of the Liang dynasty in 502 CE.
Wikipedia: http://en.wikipedia.org/wiki/Buddhism_in_Japan
Louise Levathes, *When China Ruled the seas*, p.40-41, citing the *Liang Shu* (History of the Liang dynasty) and (i) Paul Shao, *Asiatic Influence in Precolumbian art*, Ames, Iowa State Univ 1976, p.5-7, 3, 163 and (ii) David H.Kelley, 'Nine lords of the night', *Studies in the Archaeology of Mexico and Guatemala*, 16, Berkeley, Univ of California Dept of Anthropology, Oct 1972 & 'Calendar animals and deities', *Southwestern Journal of Anthropology*, 16, Albuqerque, Univ of New Mexico, 1960.http://www.personal.psu.edu/users/m/v/mvp111/karin.htm, citing vol.231 of *The Great Chinese Encyclopedia*, compiled by court historians of the Wang emperors from 502 to 556 AD (other refs give the editor's name as Ma Tuan-Lin);Prof V.G.Nair, *Buddhist mission visits America before Columbus*, http://www.saigon.com/~hoasen/mission.htm; http://www.1s.com/hkmission/history/chinese.htm, citing hearsay of an 1100 page diary in the Chinese imperial archives of which only 75 pages of partial excerpts seen; http://users.wi.net/~maracon/; http://www.ventanawild.org/news/se01/fusang.html;
Kenneth L. Feder, *Frauds, Myths and Mysteries: Science and Pseudoscience in Archaeology*, p113-4, citing Frost, F, 1982, The Palos Verdes Chinese anchor mystery, *Archaeology*, Jan/Feb 23-27, quoted on www.kenspy.com/Menzies/Ships.html regarding irrelevance of these anchors.
484 CE: King Jayavarman of Funan sent merchants to Guangzhou to solicit trade. The Indian Buddhist monk Nagasena accompanied them on their return, and was then sent to the Chinese court to request help for Funan against marauding Chams from Lin-yi. Nagasena reported to the Chinese emperor that he had been shipwrecked on the Cham coast and robbed. In 491 the Chinese bestowed titles and anti-piracy responsibilities on Fan Tang, the ruler of Lin-yi.
Kenneth Hall, *Maritime trade and state development in early Southeast Asia*, p.73-75.

C3rd-5th: Estimated date of the **Pontian boat**, discovered in Pahang, Malaysia in 1926, based on radiocarbon and accompanying ceramics similar to some at Oc-eo in south Vietnam, which is broadly dated to C1st-6th.
I.H.N. Evans, 'Notes on the remains of an old boat found at Pontian'; C.A. Gibson-Hill, 'Further notes on the old boat found at Pontian, in south Pahang'; Sean McGrail, *Boats of the World*, p.305; Pierre-Yves Manguin, 'Southeast Asian shipping in the Indian Ocean during the first millennium AD'.
mid-late C5th: a Sanskrit inscription found near Jakarta Bay records that king Purnavarman of Tarumanagara (the Tarum river basin) diverted the river to improve drainage and make the port more accessible for trading vessels.
Kenneth Hall, *Maritime trade and state development in early Southeast Asia*, p.105, citing J.Ph. Vogel, 'The earliest Sanskrit inscriptions of Java', *Publicaties van de Oudheidkundige Dienst in Nederlandsch-Indie* 1 (1925):15-35; J.G. de Casparis, *Indonesian Palaeography*, 18-20; H.B. Sarkar, *Corpus of the inscriptions of Java (up to 928 AD)* Calcutta, 1971-72, vol 1:1-12; and J. Noorduyn & H.Th. Verstappen, 'Purnavarman's river works near Tugu', *BKI* Leiden 128 (1972): 298-307. The river diversion was in the 22nd year of Purnavarman's reign. Hall notes that Van der Meulen's belief that Purnavarman conquered Ho-lo-tan shortly after 452 AD, the date of its last embassy to China: W.J. Van der Meulen, 'In search of Ho-ling', *Indonesia* 23 (1977): 87-111.
Southern Dynasties [420-589 CE]: Guangzhou was a prosperous port filled with merchant ships, merchants and envoys. Many Buddhist monks came from India; the centre of their teaching and sutra translation was Guangxiao temple.
G'zhou Mar.Silk Rd 2001, p.29; Maritime Silk Route 1996, p.59, 74.
520-525 CE: Cosmas Indicopleustes, a theologian, geographer and merchant from Alexandria, visited Malabar, mentioning Christians, and a bishop ordained in Persia. He wrote of ships visiting Sri Lanka from many countries, including China.
Ishwar Sharan, http://hamsa.org/05.htm; Prof W.I. Siriweera, http://lakdiva.net/coins/media/cdn_1998.06.21_china_trade.htm
527 CE: The Indian monk Bodhidharma voyaged to Guangzhou to preach Buddhism. His landing place was later called *Xi Lai Chu*

Di ('first landfall on journeying from the west'), and is the site of Hualin temple.
G'zhou Mar.Silk Rd 2001, p.29; Maritime Silk Route 1996, p.59, 74-5.
Wikipedia: http://en.wikipedia.org/wiki/Bodhidharma
588-589 CE: Sui forces defeated Chen in major river battles on the Yangzi. Thousands of ships were involved; the largest had five decks and carried 800 men.
David Graff, *Medieval Chinese Warfare*, p.132-4, citing Sima Guang, *Zizhi tongjian* (Comprehensive mirror for aid in government); Beijing, Guji chubanshe, 1956.
594 CE: The Sui emperor Wen (who started a major extension of China's canal network) ordered the establishment of the Nanhaishenmiao (temple to the god of the South China Sea), near today's Miaotou village at Huangpu near Guangzhou. During the Tang and Song dynasties it was customary for the crew of all ships, Chinese and foreign, to pray there before going to sea. Many stone tablets relating to overseas trade are preserved, along with statues and masks of foreigners.
G'zhou Mar.Silk Rd 2001, p.29; Maritime Silk Route 1996, p. 82-83.
595 CE: Emperor Wen ordered confiscation of vessels over 30 feet, except in the Sui heartland of Guanzhong.
David Graff, *Medieval Chinese Warfare*, p.139, citing Wei Zheng et al, *Sui shu* (history of the Sui dynasty); Beijing, Zhonghua shuju, 1973, and Arthur Wright, 'The Sui dynasty', in *The Cambridge History of China*, UK, 1979.
598 CE: Emperor Wen sent a fleet from Shandong to attack Pyongyang; many of the ships were lost in storms in the Yellow Sea. A land force fared no better.
David Graff, *Medieval Chinese Warfare*, p.145, citing Sima Guang, *Zizhi tongjian* (Comprehensive mirror for aid in government); Beijing, Guji chubanshe, 1956.
Sui dynasty [581-618 CE]: A catamaran approximately 35 metres long has been excavated at Pingdu in the Shandong province of China.
Quanzhou maritime museum, model and caption; Qingdao museum


Model of the Sui dynasty catamaran

C 6th: Hindu writer Sundaramurthi Nayanar mentions Mahatittha in

Sri Lanka as a port with many ships.
Rohan
Jayatilleke, http://origin.sundayobserver.lk/2001/08/19/fea20.html
The cult of Buddha Dipamkara, the 'calmer of the waters', has been traced to 6th century bankers at Anuradhapura in Sri Lanka who were financing trade with Southeast Asia. Fine Dipamkara statues of this period are distributed around Southeast Asia.
Kenneth Hall, *Maritime trade and state development in early Southeast Asia*, p.37, citing Silvain Levi, 'Les "marchands de mer" et leur role dans le bouddhisme primitif', *Bulletin de l'Association Francaise des Amis de l'Orient* 7 (Oct 1929): 19-39, and Paul Wheatley, 'Satyanrta in Suvarnadvipa: from reciprocity to redistribution in ancient Southeast Asia' in *Ancient Civilisation and Trade*, ed. J.A. Sabloff & G.C. Lamberg-Karlovsky, p.234 & 261.
607 CE: Japan started sending occasional groups of ships to China with diplomats, trade goods and students. Those in the Sui dynasty and early Tang dynasty followed the coast around the Korean peninsula, using large dugouts with side planking.
K.Nomoto & K.Ishii, 'A historical review on ships of Japanese tradition', p.99.
612-615 CE: Naval forces supported massive armies in repeated assaults on Koguryo (Korea) by the Sui emperor Yang. All failed.
David Graff, *Medieval Chinese Warfare*, p.146-156, citing Sima Guang, *Zizhi tongjian* (Comprehensive mirror for aid in government); Beijing, Guji chubanshe, 1956.
c.616 CE: The maternal uncle of the prophet Muhammad, Abu Waqqas, joined a trading voyage from Ethiopia to Guangzhou. He then returned to Arabia, and came back to Guangzhou 21 years later with a copy of the Koran. He founded the Mosque of Remembrance, near the Kwang Ta (Smooth Minaret) built by the Arabs as a lighthouse. His tomb is in the Muslim cemetery in Guangzhou.
Liu Chih, *The Life of the Prophet* (12 vols), 1721, quoted by the Islamic Council of
Victoria, http://www.icv.org.au/history2.shtmlFour missionaries were sent to China by the prophet Mohammad, and two died in Quanzhou. They were buried as honoured guests, and the tombs repeatedly repaired and embellished until the present.
Wang Lianmao (ed), *Return to the City of Light*, p.99, and

Quanzhou site captions, citing Ming Shu, '*A history of Fujian province*'.


Model of Emperor Yangli's dragon boat

618 CE: China's canal network had grown to 2000km, linking the southern 'rice bowl' and the northern plains. Emperor Yang cruised it in a lavish 'Dragon Fleet', pulled by 80,000 men, accompanied by musicians and guards. His own boat had 4 decks, a throne room, and 120 exquisitely decorated rooms for concubines. Conspicuous extravagance fanned discontent and the fall of the Sui dynasty.
Ann Paludan, *Chronicle of the Chinese emperors*, p84-87; see also Liu Pean, 'Viewing Chinese ancient navigation and shipbuilding through Zheng He's ocean expeditions', p.177.
644 AD: The Tang emperor Taizong built 500 ships to support the planned attack on Koguryo.
David Graff, *Medieval Chinese Warfare*, p.196, citing Sima Guang, *Zizhi tongjian* (Comprehensive mirror for aid in government); Beijing, Guji chubanshe, 1956, ch.197, p.6214, & Liu Xu et al, *Jiu Tang shu* (Old Tang history); Beijing, Zhonghua shuju, 1975, ch.199A, p.5322-3.
629-645 AD: Chinese monk Hiuen Tsang wrote about the choice of routes from Northern India to Sri Lanka (long coastal voyage deemed dangerous), and described Charitra in Orissa as a rendezvous for merchants.
S. Dhammika, http://www.lankalibrary.com/geo/ancient/hiuen.htm


Japanese envoy ship to Tang China: drawing in the Korokan museum, Fukuoka

630 CE: The first mission of Japanese envoys to China. There were 16 missions of such envoys ('kentoshi') between 630 and 894 CE; the officials were accompanied by scholars and monks, with about 500 people on each mission. About half were lost in shipwrecks.
Fukuoka City Museum captions.
651 CE: First Arab embassy to China.
Michael L.Bosworth, http://www.cronab.demon.co.uk/china.htm, citing Joseph Needham, *Science & Civilization in China*, Vol.1, p.179 - Cambridge Univ Press 1954.
663 CE: A Tang navy allied with Silla attacked the Japanese fleet

allied with Paekche in a series of naval actions at the mouth of the Kum river in Korea, reportedly sinking over 400 Japanese ships.
David Graff, *Medieval Chinese Warfare*, p.199, citing Ouyang Xiu, *Xin Tang shu* (New Tang history); Beijing, Zhonghua shuju, 1959, ch.220, p.6200-1; Liu Xu et al, *Jiu Tang shu* (Old Tang history); Beijing, Zhonghua shuju, 1975, ch.199A, p.5331-3; & Sima Guang, *Zizhi tongjian* (Comprehensive mirror for aid in government); Beijing, Guji chubanshe, 1956, ch.200, p.6323-4, 6329-30, & ch.201, p.6336-8.
670s: Chinese traveller I Ching visited Srivijaya in Sumatra, and found Buddhism well established. In 692 he noted that Srivijaya had absorbed Malayu [Jambi, SE Sumatra].
Stuart Munro-Hay, *Nakhon Sri Thammarat*, 1.6.
by 674 CE: A colony of overseas Muslims existed on the west coast of Sumatra.
The Islamic Council of Victoria, http://www.icv.org.au/history2.shtml, citing Cesar Adib Majul, *Muslims in the Philippines*, University of the Philippines Press, Quezon City, 1999 p.44.
682 CE: The first known inscription of a king of Srivijaya was incised on a river boulder at Kedukan Buket, Palembang in Sumatra.
Stuart Munro-Hay, *Nakhon Sri Thammarat*, 1.6.
686 CE: The Kotakapur inscription found on Bangka island records preparation of a naval expedition by Srivijaya against rival ports in western Java.
Kenneth Hall, *Maritime trade and state development in early Southeast Asia*, p.108, citing P.Pelliot, 'Deux itinéraires de Chine en Inde à la fin due VIIIe siècle', *BEFEO* 4 (1904), p.284. Hall notes that Taruma on the Sunda straits sent an embassy to China in 666-9, but the Chinese never heard from thisJavanese port again.
C7th: Some 200,000 Persians, Arabs, Indians, Malays, and other foreigners lived in Guangzhou as traders, artisans and metalworkers.
Louise Levathes, *When China Ruled the seas*, p.39.
702 CE: Japanese missions to China had to switch to the open sea due to unrest in Korea, probably using ships built by Chinese immigrants. There were eight missions between 702 and 840 CE, each of two to four ships.
K.Nomoto & K.Ishii, 'A historical review on ships of Japanese

tradition', p.99
716 CE: The Tang emperor Xuanzong was impressed by a visiting foreigner who told him about the riches of the south seas: huge pearls, beautiful feathers, and Sinhalese drugs. He ordered an expedition to accompany the foreigner home, but was dissuaded by the bureaucrat Yang Fanchen.
Louise Levathes, *When China Ruled the seas*, p.36, citing Sima Guang, *Zi zhi tong jian* ('Comprehensive mirror for aid in governance'), written 1067-1084, Beijing, Zhonghua shuju, 1956, chap.211..
748 CE: Chinese monk Jian Zhen (Jianzhou, of Daming monastery in Yangzhou), failed in his fifth attempt to sail to Japan, and drifted to Guangzhou where 'many big ships came from Borneo, Persia, Qunglun [Indonesia/Java]... with... spices, pearls and jade piled up mountain high'. The largest ship looked like a mansion, with sails many *zhangs* high. [1 *zhang* = 3.11 metres.] Sri Lanka was by now the major shipping centre, with ships visiting from India, Persia and Ethiopia; Sri Lankan ships had gangways many *zhangs* high.
Tang Zhiba, 'The influence of the sail on the development of the ancient navy', p.61
Wikipedia: http://en.wikipedia.org/wiki/Jianzhen
753 CE: Jianzhou reached Japan on the sixth attempt, on a ship sent from Japan. He founded Toshodaiji monastery near Nara, in the same style as Daming.
Quanzhou museum & Yangzhou museum captions.
758 CE: Arabs looted and burned Guangzhou.
Michael L.Bosworth, http://www.cronab.demon.co.uk/china.htm, citing Joseph Needham, *Science & Civilization in China*, Vol.1, p.179 - Cambridge Univ Press 1954.The emperor then closed Guangzhou to foreigners for fifty years.
Louise Levathes, *When China Ruled the seas*, p.39.
762 CE: The Abbasid caliph Al-Mansur founded a new capital at Baghdad: a carefully chosen site to which, an advisor noted, supplies would come up the Tigris river in ships from China and India.
Abu Ja'far Muhammad Al-Tabari (839-923), 'The History of Al-Tabari', cited in Amira Bennison, 'The Great Caliphs', p.69
774 CE: Javanese attacked Champa, destroying the Po Nagar temple at Nha Trang.

Emmanuel Guillon, *Cham Art*, p.195
775 CE: The 'Ligor inscription' found in the region of Nakhon Si Thammarat to Chaiya [east coast of Thailand] records the dedication of three Buddhist stupas by the ruler of Srivijaya. Stuart Munro-Hay, *Nakhon Sri Thammarat*, 1.6 & 3.2, emphasizes that the stone was moved in the early C20th and provenance is confused, but that it tends to confirm Srivijayan activity in the region. On the reverse is an inscription about the Sailendra family, variously interpreted. The inscription is in the Sanskrit language, written in late Pallava letters - as are two other early inscriptions, one dated C6-7th on a huge rock at Hup Khao Chong Koy, and one dated C6-8th at Wat Maheyong in Nakhon Sri Thammarat (Munro-Hay 3.1 & 3.4).
670-780 CE: tentative date of the wreck discovered at **Punjulharjo** in Central Java.
http://www.thejakartapost.com/news/2009/07/10/ancient-boat-reveals-shipbuilding-skills-java%E2%80%99s-seafarers.html; http://www.thejakartaglobe.com/home/maritime-museum-plan-runs-aground-threatening-nations-oldest-known-ship/396524;http://indocropcircles.wordpress.com/2012/02/13/ditemukan-perahu-tertua-di-indonesia/; http://www.youtube.com/watch?v=GNohWyUMcKw; Waluyo Agus Priyanto, 'Conservation Research and Treatment Programs: Case Study of Ancient Boat Site in Rembang Regency', http://www.themua.org/collections/items/show/1263
787 CE: Javanese attacked Champa for the second time, destroying a temple near the imperial capital at what is now Phan Rang.
Tran Ky Phuong, *Unique Vestiges of Cham Civilization*, p.9, Emmanuel Guillon, *Cham Art*, p.195
c.790 CE: the kingdom of Sailendra (builders of Borobodur, in Java), defeated Chenla (in Cambodia), and ruled it for twelve years.
http://home.iae.nl/users/arcengel/Indonesia/100.htm
C8th: Chinese merchants had crossed oceans to trade in Japan, Champa, and Java.
Thuan Luc, http://www.charm.ru/coins/vn/nagasaki.shtmlQuanzhou by this time played an important part in the maritime trade of South China.
Wang Lianmao (ed), *Return to the City of Light*, p.14
China set up the Bureau of Merchant Shipping in Guangzhou, to

monitor all imports and exports. Imports were subject to duties of up to 25%, but changed capriciously. Some frustrated merchants preferred Vietnam.
Louise Levathes, *When China Ruled the seas*, p.38-39.
From C8th to C18th, the modern Thai provinces of Phatthalung, Songkhla and Nakhon Si Thammarat were major centres of trade. http://museum.bu.ac.th/Newsletter/SEACM_V8_no2.pdf, p5-14.
766-804 CE: China had very large river and canal boats, estimated at 700 tons. 'The crews of these ships lived on board; they were born, married and died there. The ships had... lanes (between the dwellings), and even gardens. Each one had several hundred sailors... South to Chiangsi and north to Huainan they made one journey in each direction every year, with great profit..... The sea-going junks (hai-po) are foreign ships. Every year they come to Canton and An-i. Those from Ceylon are the largest...When these ships go to sea, they take with them white pigeons, so that in case of shipwreck the birds can return with messages.'
Michael L.Bosworth, http://www.cronab.demon.co.uk/china.htm, citing Joseph Needham Vol. 4 Part III, p.452-3 (Cambridge Univ Press, 1971), which in turn quotes Tang Yu Lin's *Tang Yu Lin* (Miscellanea of the Tang Dynasty), compiled in the Song dynasty.
785-805 CE: Chinese merchant ships sailing from Guangzhou were calling regularly at Sufala on the east African coast, to cut out Arab middlemen.
Shen Fuwei, *Cultural flow between China and the outside world*, p.155,
786-809 CE: A diplomatic present of exquisite Chinese porcelain to Caliph Harun al Rashid of Baghdad caused a sensation at that court.
Shen Fuwei, *Cultural flow between China and the outside world*, p.163.
820 CE: A map by Muhammad ibn Musa al-Khwarizmi of the Sea of Java includes the Cape York Pensinsula, a "V" shaped Gulf of Carpentaria, and a curved Arnhem Land. (A later map, by Abu Isak Al-Farisi Istakhari in 934 CE, also includes an outline of the northern coast of Australia.)
The Islamic Council of
Victoria, http://www.icv.org.au/history2.shtml, citing Eric

B.Whitehouse, *Australia in Old Maps 820-1770*, Boolarong Press, Queensland, 1995 p.65-66.
826 CE: date written on a bowl on the Arab / Persian ship which probably sailed not long after, and sank at **Batu Hitam**, off **Belitung** island, between Sumatra and Kalimantan. The cargo was entirely from China, apparently destined for the Middle East, on a through voyage via the Sunda Strait. The ship was of Middle Eastern construction, made of mostly African timber, sewn together with rope (possibly hibiscus, implying resewing in Southeast Asia); it was 20-22m long and 5m wide. The bulk of the cargo comprised mass-market Changsha ceramics, including 40,000 bowls, 1635 ewers, 763 inkpots, and 915 spice jars: motifs include Buddhist symbols, Persian-carpet and geometric designs, date palms, and Arabic Muslim scripts. In one area of the stern, there were items of imperial quality, which include fine Ding and Yue ceramics, three blue-and-white saucers (the earliest intact blue-and-white so far found), an octagonal gold cup with decorations including a Persian dancer and Central Asan figures, and exquisite silver boxes - a royal commission or gift? perhaps to the Abbasid caliph in Baghdad? Other finds include a cast & wrought iron & wood anchor, lead ballast, silver ingots, many coins from 618-626CE, and star anise.
***** Regina Krahl, John Guy, J.Keith Wilson & Julian Raby, ed, *Shipwrecked: Tang treasures and monsoon winds* ***, Smithsonian Books, 2011. ISBN 978-978-1-58834-305-5, 978-0-934686-18-1.**
Michael Flecker, 'A 9th-century Arab or Indian shipwreck in Indonesian waters', *IJNA* (2000) 29.2: 199-217; **addendum**, *IJNA* (2008) 37.2: 384-386;
Michael Flecker, 'A ninth century AD Arab or Indian shipwreck in Indonesia: first evidence for direct trade with China', *World Archaeology* (2001) Vol 32(3):335-354;
Detailed descriptions of the artefacts from the 2004 catalogue of the Belitung wreck by Seabed Explorations:
Michael Flecker, 'Miscellaneous artefacts', http://nsc.iseas.edu.sg/documents/belitung/The%20Belitung%20Wreck/22_flecker_misc_kat_656to705.pdf; Francois Louis, 'Gold & silver artefacts', http://nsc.iseas.edu.sg/documents/belitung/The%20Belitung%20Wreck/08_louis1_kat_154to191.pdf; Francois Louis, 'Bronze

mirrors',
overview, http://nsc.iseas.edu.sg/documents/belitung/The%20Belitung%20Wreck/09_louis2_%20192to199.pdf; Francois Louis, 'Bronze mirrors',
artefacts, http://nsc.iseas.edu.sg/documents/belitung/The%20Belitung%20Wreck/10_louis2_kat_200to223.pdf; Hsieh Mingliang, 'White wares with green
décor', http://nsc.iseas.edu.sg/documents/belitung/The%20Belitung%20Wreck/13_hsieh2_kat_246to299.pdf; Regina Krahl, 'White wares of Northern
China',http://nsc.iseas.edu.sg/documents/belitung/The%20Belitung%20Wreck/15_krahl1_kat_312to349.pdf; Regina Krahl, 'Green wares of Southern
China', http://nsc.iseas.edu.sg/documents/belitung/The%20Belitung%20Wreck/17_krahl2_kat_368to463.pdf; Liu Yang, 'Changsha ceramics', part
1,http://nsc.iseas.edu.sg/documents/belitung/The%20Belitung%20Wreck/19_liu_kat_b_504to567.pdf; part
2, http://nsc.iseas.edu.sg/documents/belitung/The%20Belitung%20Wreck/20_liu_kat_b_568to639.pdf;
Roxanna Brown, 'History of shipwreck excavation in Southeast Asia, Belitung 2004
catalogue, http://nsc.iseas.edu.sg/documents/belitung/The%20Belitung%20Wreck/02_brown_040to055.pdf.
'Shipwrecked: Tang treasures and monsoon winds', Smithsonian museum exhibition
site, https://www.asia.si.edu/Shipwrecked/; http://maritime-explorations.com/belitung.htm; Lim Ya Chiew, 'Changsha blue and copper red wares and the religious motifs', www.koh-antique.com/lyc/belitung_shipwreck.htm; Andreas Rettel, 'The concept of the conservation of seawater finds',
2004, http://www.asia.si.edu/exhibitions/SW-CulturalHeritage/downloads/05Rettel092-115.pdf; http://ngm.nationalgeographic.com/2009/06/tang-shipwreck/worrall-text/1;http://www.cnngo.com/singapore/play/displaying-tang-dynasty-treasures-ninth-century-shipwreck-786465; exhibition opened Feb11 http://www.marinelink.com/news/shipwrecked-treasures337223.aspx; http://idlethink.wordpress.com/2009/07/14/

curating-the-oceans-the-future-of-singapores-past/; http://news.bbc.co.uk/2/hi/programmes/from_our_own_correspondent/7675866.stm; http://thejakartaglobe.com/artsandentertainment/unearthed-treasure-waits-in-singapore/331093; http://www.southeastasianarchaeology.com/2007/06/28/the-belitung-shipwreck/;http://www.youtube.com/watch?v=dkrbQ7DH2Oc&feature=related; http://www.independent.co.uk/news/world/asia/the-1200yearold-sunken-treasure-that-revealed-an-undiscovered-china-559906.html; http://www.sail-world.com/Asia/Another-ancient-sailing-ship-to-set-forth/65387;www.china.org.cn/english/2004/May/96658.htm; Der Spiegel Jan06 on dispute www.cronaca.com/archives/002259.html; Smithsonian press release Mar11 on exhibition controversy http://www.asia.si.edu/press/2011/prShipwreckedBackgrounder.asp; Smithsonian, 'Underwater cultural heritage: issues raised by the Belitung shipwreck', http://www.asia.si.edu/exhibitions/SW-CulturalHeritage.asp; Robin McDowell, 'Indonesian waters mean riches and headaches', http://www.huffingtonpost.com/2012/03/31/indonesias-shipwrecks-mea_n_1393473.html; ceramics remaining in Indonesia, http://museum.bu.ac.th/Newsletter/SEACM_V8_no1.pdf; **National Geographic documentary 'Secrets of the Tang treasure ship'** part 1 http://www.youtube.com/watch?v=7sLMa78nUtc, part 2 http://www.youtube.com/watch?v=kjefPjDFN0A, part 3 http://www.youtube.com/watch?v=IkcYSiT1rrc, part 4 http://www.youtube.com/watch?v=2ih95eOkrA8; video in Mandarin & English http://www.youtube.com/watch?v=4A_e34OMacU; **reconstruction and voyage of the 'Jewel of Muscat'**, www.jewelofmuscat.tv; Georgetown interview with Dr Tom Vosmer http://www.southeastasianarchaeology.com/2010/06/16/aboard-jewel-muscat/

2nd quarter of C9th: Large quantities of Changsha ceramics have been discovered in Egypt and Oman; they were exported via Guangzhou.

Maritime Silk Route 1996, p.92.
830 CE: estimated date of colonization of Madagascar by Indonesians - who may or may not have intended to travel so far. Murray Cox et al, 'A small cohort of Island Southeast Asian women founded Madagascar', Proc.R.Soc.B rspb20120012; http://news.discovery.com/history/madagascar-women-120320.html; http://www.msnbc.msn.com/id/46809678/ns/technology_and_science-science/#.T7ynoVJq3ZA;http://www.physorg.com/news/2012-03-indonesian-eves-colonised-madagascar-years.html
838-847 CE: Japanese monk Ennin visited China, keeping a detailed diary. Yangzhou, the major grain transport hub of the Tang dynasty was flourishing: 'market places dot a ten league thoroughfare; when night markets open, a myriad lights glow under the azure sky.' Kevin Bishop, *China's Imperial Way*, p.123; replica of Ennin's journal, and of the list of Buddhist scriptures he brought back, in Fukuoka City Museum.
Wikipedia: http://en.wikipedia.org/wiki/Ennin
846 CE: Arab geographer Ibn Khurdadhbih wrote that the ruler of Srivijaya would throw a gold bar daily into the sea. On the ruler's death, the gold bars were retrieved and distributed - first to the royal family, next to military commanders, and the remainder to the subjects. In 916, Abu Zaid recorded the same custom.
Kenneth Hall, *Maritime trade and state development in early Southeast Asia*, p.80-81, citing G. Ferrand, 'L'empire sumatrannais de Crivijaya', *JA* 20 (1922): 57 & G.R. Tibbetts, *A study of the Arabic texts containing material on Southeast Asia*, Leiden, 1979, p.29 & 33-34.
850 CE: The stone epitaph on the tomb of Li Jingshi, Governor of Guangzhou and *shiboshi* or Commissioner of Maritime Affairs, notes that the port was at this time 'thronged with foreign merchants and precious goods'. The 'livelihood and economy' section of the *Songshi* (history of the Song dynasty) refers to the Guangzhou Commisssion of Maritime Affairs and records the history of trade with Southeast and West Asia.
Maritime Silk Route 1996, p.80
first half of the C9th, or earlier: tentative date of the '***Phanom Surin***' ship found at a river site in Samut Sakhon province on the

Gulf of Thailand, about 30km from Nakhon Pathon, an important centre of the Dvaravati civilisation. The ship is about 25 metres long (keelson 17.65m), sewn together in Arab style and structurally similar to the Belitung ship, with two round masts (one 17.37m high). It was carrying stoneware jars similar to C8th amphoras produced in Greece and Egypt, but which may be from the Middle East or India; these contained dammar. It also contained carinated Dvaravati-style earthenware pots, green-glazed jars from the Guanchong kilns in Guangdong, and another jar from the Fengkai kiln in Guangdong. Finds include rattan and fibre ropes, halved and pierced coconut shells, toddy palms, betel nuts, rice, fish and animal bones and elephant tusk. The unexcavated **Khuan Thani** ship in Kantang district of Trang province on the southwest coast of Thailand is said to be similar.
http://museum.bu.ac.th/Newsletter/SEACM_V8_no1.pdf; http://www.bangkokpost.com/lifestyle/family/413237/up-from-the-deep
first half of the C9th: finds of many Chinese ceramics, some Persian blue glazed ware and glass beads suggest thriving trade at the port of Laem Pho on the Gulf of Thailand near the modern city of Surat Thani, and across the isthmus to the port of Thung Tuk on the Andaman Sea in Ko Kho Khao.
http://museum.bu.ac.th/Newsletter/SEACM_V8_no1.pdf
851 CE: Arab merchant Suleiman al Tajir saw the manufacture of Chinese porcelain, and marvelled at its transparency.
Shen Fuwei, *Cultural flow between China and the outside world*, p.163.
He also described the port of Guangzhou and its mosque, public granaries and dispensaries, complex administration, written records, treatment of travellers, and the use of ceramics, rice-wine and tea.
Frances Wood, *Did Marco Polo go to China?*, p.143, citing Abbé Renaud, *Anciennes Relations de l'Inde et de la Chine de deux voyageurs Mahoumetans qui y allèrent dans le IXe siècle*, 1718, per Col. Sir Henry Yule, *Cathay and the way thither*, London 1916.
-863 CE: Chinese author Duan Chengshi described the slave trade and production of ivory and ambergris in the country of Bobali, thought to be Berbera in Somalia. From the C9th onwards, Chinese sources have good descriptions of Africa.
Louise Levathes, *When China Ruled the seas*, p.38, citing Duan Chengshi, d.863AD, *Yuyang za zu* (Miscellany of Yuyang moutains),

transl. G.S.P. Freeman-Grenville, *The East African coast, select documents C1-19th*, London 1975 [863].
878 CE: Chinese rebel forces under Huang Chao, who sacked Guangzhou, killed an estimated 120,000 Jews, Christians, Muslims and other foreigners, in addition to local residents.
Louise Levathes, *When China Ruled the seas*, p.39, citing the C10th Arab writer Abu-Zayd of Siraf, and George F. Hourani, *Arab seafaring*, Princeton, 1951, p.76-78.
Tang dynasty [618-907 CE]: Arab merchant Shulama praised the seaworthiness of large Chinese-built ships, but noted that the draft was too deep to enter the Euphrates, necessitating small boats to land passengers and cargo. Ships crossing the Indian ocean were about 20 *zhang* long and could carry 6-700 passengers.
Liu Pean, 'Viewing Chinese ancient navigation and shipbuilding through Zheng He's ocean expeditions', p.178Abbasid pottery imitations of Tang white ware, made in Mesopotamia, have been found at Mantai and Anuradhapura in Sri Lanka alongside the Chinese originals.
John Carswell, *Blue & White*, p.59.Fustat (old Cairo) was a major destination for Chinese ceramic exports for 500 years, starting in the Tang dynasty.
John Carswell, *Blue & White*, p.65-67. citing Tsugio Mikami, 'China and Egypt: Fustat', *Transactions of the Oriental Ceramic Society* 1980-81, vol 45, London, 1982, p.67-89.

839-907 CE: Thirty seven voyages were registered between the Chinese port of Ningbo and Japan; the ships used were now built by Chinese workmen, whether in Chinese or Japanese yards, and said to be safer than the boats used in earlier years by Japanese envoys to China.
Shen Fuwei, *Cultural flow between China and the outside world*, p.154.
903 CE: Arab geographer Ibn Faqih described China as renowned for three major exports: silk, porcelain, and lamps.
Shen Fuwei, *Cultural flow between China and the outside world*, p.163.
908-11 CE: A two-part Cham inscription records two official missions to Java by an envoy of the Cham king Jaya Simhavarman. A contemporary Javanese inscription refers to both Khmer and

Cham merchants in Java.
Kenneth Hall, *Maritime trade and state development in early Southeast Asia*, p.184, citing Edouard Huber, 'Lepigraphie de la dynastie de Dong-du'o'ng', *Bulletin de l'École Française d'Extrême-Orient*, 11 (1911):299 and A.M.Barrett, 'Two old Javanese copper-plate inscriptions of Balitung', MA thesis, Univ of Sydney, 1986, p.129.
930 CE: A large turquoise jar of the Sasanian / Islamic type was in the tomb of Lia Hua near Fuzhou.
John Carswell, *Blue & White*, p.59-60, citing Feng Xianming, 'Persian and Korean ceramics unearthed in China', *Orientations* 17.5, Hong Kong, 1976, p.4-7.
932 CE: An inscription notes a 'king of the Sunda Straits', restored to royal status.
Kenneth Hall, *Maritime trade and state development in early Southeast Asia*, p.108, citing F.D.K. Bosch, 'Een Maleische inscriptie in het Buitenzorgsche', *BKI* 100 (1941): 49-53, and L.C. Damais, 'Études d'epigraphie Indonésienne, III. Liste des principales inscriptions datées de l'Indonésie', *BEFEO* 46 (1952-4): 98-103, no.275, 283, 289. Hall suggests that this plus three Javanese inscriptions of similar date found on the Sumatran side of the straits suggests a reemergence of Javanese authority, often subordinate to Srivijaya.
938 CE: Ngo Quyen defeated a fleet of the occupying Chinese on the Bach Dang river near Hai Phong, by enticing the ships upriver at high tide, to be impaled on metal-tipped stakes as the tide fell. He declared independence.
Nguyen Khac Vien, *Vietnam: a long history*, p.29-30.
early-mid C10th: tentative date of the wreck found near the **Intan** oil field in the Java Sea, thought to be an Indonesian lash-lugged craft bound from Palembang to central or eastern Java, with a diverse cargo of Chinese, Thai, Indonesian and Arab goods. A Chinese coin of 918 CE gives the earliest date.
Michael Flecker, *The Archaeological Excavation of the 10th century Intan shipwreck*; Michael Flecker, 'Treasure from the Java Sea (the 10th century Intan shipwreck)', http://www.maritime-explorations.com/Intan.pdf; http://maritime-explorations.com/intan.htm
mid-late C10th: tentative date of the **Cirebon** (aka **Nan Han**)

wreck in Indonesia, apparently bound for Central or Eastern Java. The site was 40m square, and the ship of lashed-lug Southeast Asian construction, carrying ceramics from China, Thailand, Vietnam & Persia, Chinese bronze mirrors and Indonesian bronze statues, Middle Eastern glass vessels and swords, and artefacts of Egyptian origin. Finds include pearls, rubies, sapphires, garnets, gold jewellery, Fatimid rock crystal, Iranian glassware, and 2 tons of lapis lazuli. Chinese ceramics made up 75% of the cargo volume, and include many pieces of imperial quality. Lead coins on the Cirebon wreck were from the Demesne of Nan Han, around Guangzhou, 917-971 CE. One bowl had a date thought to equate to 968CE.
http://cirebon.mariemont.museum; Yvonne Tan, 'Cirebon Cargo of Yue Ceramics Vessels', Asian Art newspaper May 2007, http://www.seaceramic.org.sg/articles/cirebon_cargo.html; Southeast Asian Ceramics Museum Newsletter Vol III no3 May06, Vol III no7 Dec06;http://english.epochtimes.com/news/5-10-29/33803.html; http://www.bloomberg.com/apps/news?pid=newsarchive&sid=aSHV6Zb9pDeU; http://news.bbc.co.uk/2/hi/asia-pacific/6162804.stm; dispute news Mar06 http://nationmultimedia.com/worldhotnews/read.php?newsid=30000939; auction due May10 http://www.google.com/hostednews/afp/article/ALeqM5iKWgt-j1CJujMXf4dXrBNj6wrl6w.

mid-late C10th: tentative date of the **Karawang** wreck in Indonesia, also apparently bound for Central or Eastern Java. Many of the ceramics are similar to those on the Cirebon wreck, but of lower quality and with no such masterpieces. Coins are from the Kingdom of Min in Fujian, 916-946 CE and the demesne of Nanhan, around Guangzhou 917-971CE.

979 CE: A Cham naval expedition attacked the Vietnamese capital Hoa Lu in the Red River delta, but the fleet was destroyed in a gale, and only the king's ship survived. The Vietnamese retaliated in 982, destroying the Cham capital Indrapura; the Cham capital was eventually moved south to Vijaya (Binh Dinh).
Kenneth Hall, *Maritime trade and state development in early Southeast Asia*, p.181, citing Henri Maspero, 'Le protectorat general

d'Annam sous les T'ang', *Bulletin de l'École Française d'Extrême-Orient*, 10 (1910): 678.
981 CE: The Song dynasty attacked Vietnam by land and sea, with clashes at the Bach Dang river and further south, and were repulsed by general Le Hoan.
Nguyen Khac Vien, *Vietnam: a long history*, p.30; Hanoi History Museum captions
990-1007 CE: Intermittent war between the Javanese kingdom of Mataram and Srivijaya.
Nicholas Tarling, *Cambridge History of Southeast Asia*, p.207; http://home.iae.nl/users/arcengel/Indonesia/100.htm.
993 CE: The Yemeni captain Abu Himyarite, a frequent visitor to China, toured Guangzhou port.
Shen Fuwei, *Cultural flow between China and the outside world*, p.157-8.
C 7-10th: Chinese ceramics found at Mahatittha and monastic sites in Sri Lanka indicate brisk ceramic trade.
Prof W.I.
Siriweera, http://lakdiva.net/coins/media/cdn_1998.06.21_china_trade.htm
C9-10th: Islamic ceramics of the C9-10th have been found at Trang Soi sand dune near the Hoi An river.
Museum of Trade Ceramics, Hoi An, artefacts and captions
C10th: 'Citong' (Paulownia) trees were planted around the newly expanded city walls of Quanzhou (circumference
10km), *citong* became a city nickname, and visitors from the Middle East recorded this as *Zaiton* - which means olive in Arabic, leading to later confusion. *Satin* (the cloth) derived its name from Zaiton.
Quanzhou museum caption.
C10th: Seafarers and merchants from Champa had contacts with Brunei and Ma-yi (Mindoro, in the Philippines).
Allison Diem, 'Vietnamese ceramics from the Pandanan shipwreck excavation in the Philippines', *Taoci*, 2001, citing William Henry Scott, *Filipinos in China before 1500*, Manila, 1999.
C10th: The geographer Ibn Rusta recorded an island in the Riau or Lingga archipelago, whose ruler headed the Srivijayan army, famous for camphor and its ability to protect or harass passing ships.
Kenneth Hall, *Maritime trade and state development in early*

Southeast Asia, p.94, citing G.R. Tibbetts, *A study of the Arabic texts containing material on Southeast Asia*, Leiden, 1979, p.31.
late C10th: Egyptian and Arabic ceramics of this period have been found in the Philippines - always in association with Chinese products.
Dr Jesus T.
Peralta, http://www.ncca.gov.ph/phil._culture/traditional_arts/glimpses/prehistory/glances/glances_ceramic-age.htm

c.1000 CE: Srivijaya levied 20,000 dinars before allowing a Jewish merchant to continue his voyage to China.
Kenneth Hall, *Maritime trade and state development in early Southeast Asia*, p.85, citing the *'Aja'ib al-Hind*, in G.R. Tibbetts, *A study of the Arabic texts containing material on Southeast Asia*, Leiden, 1979, p.44. The same source records that merchants in Srivijaya were confined to the capital, but accepted this for fear of wild animals.


The Qingjing mosque, Quanzhou

1001 CE: China's Song dynasty recorded the arrival of a diplomatic mission from the 'kingdom of Butuan' in Mindanao.
http://www.gmanetwork.com/news/story/321334/scitech/science/massive-balangay-mother-boat-unearthed-in-butuan
1003 CE: a Butuan chieftain petitioned the Chinese imperial court to allow direct trade with Guangdong, rather than via Champa as designated; the petition was declined.
http://www.gmanetwork.com/news/story/321334/scitech/science/massive-balangay-mother-boat-unearthed-in-butuan
1008 CE: Egyptian sea captain Domiyat, a frequent visitor to China, joined an imperial pilgrimage to a Buddhist site in Shandong, presented the Song emperor Zhenzong with gifts from the Egyption king, and established diplomatic relations.
Shen Fuwei, *Cultural flow between China and the outside world*, p.158.
1009 CE: The Qingjing mosque (originally known as the Aisuhabu mosque) was built in Quanzhou.
Wang Lianmao (ed), *Return to the City of Light*, p.101.
1016 CE: The Javanese suffered a devastating raid from Srivijaya, which sent a mission to China the following year referring to their ruler as 'king of the ocean lands'.

Kenneth Hall, *Maritime trade and state development in early Southeast Asia*, p.194, citing Tamil inscriptions in *Annual Report on Indian Epigraphy*, 1956-57, no.161,164,166, and *Epigraphia Indica*, 22:213-281; both journals published by the Archaeological Survey of India.

1025 CE: Rajendra Chola, the king of Coromandel in India, launched a massive raid on Srivijayan ports on both sides of the Straits of Malacca. The Tamil inscription suggests total conquest; however a new king of Srivijaya sent tribute to China in 1028.

Kenneth Hall, *Maritime trade and state development in early Southeast Asia*, p.23, 85-86, 102, 194, citing a Chola inscription from Tanjavur in south India dated 1030-1031, Nilakanta Sastri, *The history of Srivijaya*, Madras, 1949, p.80, and George W. Spencer, *The politics of expansion, the Chola conquest of Sri Lanka and Sri Vijaya*, Madras, 1983, p.100-150; ports attacked on the Malay peninsula named in the Tanjavur inscription of 1030, *South Indian Inscriptions*, 2:105-109. Possibility conquest exaggerated: Stuart Munro-Hay, *Nakhon Sri Thammarat*, 1.8.

1029-35 CE: Two inscriptions in Arabic script from Panduranga on the Cham coast (Phan Rang, just north of the Mekong delta) provide evidence of a major port there. One records the selection of a Muslim as 'agent of the bazaar' to represent merchants in their dealings with Cham authorities.

Kenneth Hall, *Maritime trade and state development in early Southeast Asia*, p.183, citing Paul Ravaisse, 'Deux inscriptions coufiques du Campa', *Journal Asiatique*, Paris, 20,2 (1922): 247-289.

1037 CE: The Brantas river in east Java was dammed by royal order to reduce flood dangers for port users, 'including ships' captains and merchants from other islands and countries'.

Kenneth Hall, *Maritime trade and state development in early Southeast Asia*, p.18, citing Kamalagyan inscription, trans. Jan Wisseman, 'Markets and trade in pre-Majapahit Java', in *Economic exchange and social interaction in Southeast Asia*, ed. Karl Hutterer, 1977, p197-212 - one of a number of inscriptions recording royal decisions on ports, warehouses, weights & measures, duties, appointment of tax collectors at ports, etc.

1044 CE: A Vietnamese seaborne expedition routed the Chams and killed their king.

Kenneth Hall, *Maritime trade and state development in early Southeast Asia*, p.181, citing George Coedès, *The Making of Southeast Asia*, trans H.M.Wright, Berkeley, 1966, p.83.
1050 CE: A Cham inscription records a royal expedition against the rebellious Cham port of Panduranga.
Kenneth Hall, *Maritime trade and state development in early Southeast Asia*, p.181& 185, citing E.Aymonier, 'Première étude sur les inscriptions Tchames', *Journal Asiatique*, Paris, 17 (1891): 29.
1067 CE: The Cholas attacked Kadaram (thought to be Takuapa, on the west coast of Thailand's Isthmus of Kra), destroying it as the dominant regional port.
Kenneth Hall, *Maritime trade and state development in early Southeast Asia*, p.199, citing Perumbur inscription, 7th year of Virarajendra I, *South Indian inscriptions*, 3,no.84, and Alastair Lamb, 'Kedah and Takuapa, some tentative historical conclusions', *Federated Museums Journal* 6 (1961):84.
1068 CE: Vira Rajendra, the king of Coromandel, captured Kedah (northwest Malaysia) from Srivijaya.
http://home.iae.nl/users/arcengel/Indonesia/100.htmVietnamese attacking the Cham capital of Vijaya by sea were surprised to encounter no naval resistance.
Kenneth Hall, *Maritime trade and state development in early Southeast Asia*, p.186, citing Georges Maspero, *Le royaume de Champa*, Paris, 1928, p141-2.
1068-1077 [Xining reign]: Chinese official Huang Huaixin outlined a plan involving a drydock for the repair of imperial dragon boats.
Louise Levathes, *When China Ruled the seas*, p.77, citing Shen Kuo, *Mengxi bi tan, bu bi tan* ('Supplement to notes taken in Mengxi') written 1086-1093, annotated by Hu Daojing, Hong Kong, Zhonghua shuju, 1975, 313.
1087 CE: The Song government established an office in Quanzhou to regulate maritime trade. Commercial tax receipts soon matched or exceeded those of South China's largest port, Guangzhou. The rapid development of foreign trade stimulated advances in shipbuilding, ceramics, textiles, metallurgy, and agricultural processing.
Wang Lianmao (ed), *Return to the City of Light*, p.14
C 11th: Persian ceramics of the 11th century are found in Sri Lanka; thereafter, Chinese ceramics predominate.

Prof W.I.
Siriweera, http://lakdiva.net/coins/media/cdn_1998.06.21_china_trade.htm
C 11th: tentative date of the 7-metre pine vessel found off **Kunsan** in the west of Korea with a cargo of ceramics.
http://times.hankooki.com/lpage/200406/kt2004061014355253460.htm
2nd half of C11th: tentative date of the 9-metre flat-bottomed Korean vessel found off **Wando** island in SW Korea with a cargo of celadon from Haenam province.
http://www.seamuse.go.kr/en/?sub=6, http://www.mm.wa.gov.au/Museum/march/department/oseas.html; Kim Zae-Geun, 'The Wreck excavated [from] Wando island'.
late C11th / early C12th: tentative date of the 22-metre sailing barge found at **Kadakkarapally** in Kerala, SW India (the Thaikkal find).
http://wedigboats.org/Thaikkal.htm; http://www.rpmnautical.org/india.htm
late C11th / early C12th: Song *qingbai* and other ceramics found in a sand dune at Allaipiddi in Sri Lanka.
John Carswell, *Blue & White: Chinese porcelain around the world*, p.168-171; Prof W.I.
Siriweera, http://lakdiva.net/coins/media/cdn_1998.06.21_china_trade.htm.
C11th-C12th: Fortified Chinese trade bases were established in the Philippines, to gather forest products and distribute imports, and the archaeological sites of Laguna, Mindoro and Cebu show significant social change.
Kenneth Hall, *Maritime trade and state development in early Southeast Asia*, p.24, citing Karl L.Hutterer, 'The evolution of Philippine lowland societies', *Mankind*, 9 (1974): 287-299, and *An archaeological picture of a pre-Spanish Cebuan community*, Cebu, 1973.
1117: Regulations and navigation for sea-going ships were described by Zhu Yu, son of a former high port official and then governor of Guangzhou. Large ships carried several hundred men, the smaller ones more than a hundred. They navigated by the coasts, the stars, the compass, and seabed sampling.
Robert Temple, *The Genius of China* (from Needham), p.150,

citing *Pingzhou Ketan* (Pingzhou chats).The same book describes the loading of ships - 'the greater part of the cargo consists of pottery, the small pieces packed in the larger, till there is not a crevice left' - and the keeping of foreign slaves in Guangzhou.
Ceramics: John Carswell, *Blue & White*, p.59, citing Chu Yu, *P'ing-chou k'o'tan*, Taipei, 1975. Slaves: Louise Levathes, *When China ruled the seas*, p.37, citing Zhou Qufei, *Ling wai dai da* (about regions beyond the mountain passes), 1178, per J.J.L. Duyvendak, *China's discovery of Africa*, London Univ, 1949, p. 24. Text of *Pingzhou Ketan* shown in *The Maritime Silk Route*, 1996, p.88.It also describes the Srivijayan government's monopoly over sandalwood exports, the Chinese Trade Office monopoly over frankincense imports, and the official fixing of commodity prices in the ports of Srivijaya.
Kenneth Hall, *Maritime trade and state development in early Southeast Asia*, p.99-100.
1129: Khmer king Suryavarman II sent a fleet to plunder the Vietnamese coast.
Nguyen Khac Vien, *Vietnam: a long history*, p.126
1129: Gaozong, who had declared himself emperor of China after the fall of Kaifeng and spent the first eight years on the run, escaped in 1129 only after taking to sea. He went on to establish the southern Song dynasty with its capital at Hangzhou - and with half his land gone, to encourage maritime trade and the resultant revenues. The government funded harbour improvements, warehouse construction and navigation beacons. In 1132, the emperor ordered the establishment of China's first permanent navy, and offered rewards for innovative ship design. Chinese scholars studied and extended Arab and Hindu knowledge of geography and navigation.
Ann Paludan, *Chronicle of the Chinese emperors*, p136; Louise Levathes, *When China Ruled the seas*, p.41-42.
1154: Al-Idrisi, a Moroccan geographer, published his *Geography*, which contained a world map, and described Chinese merchant ships carrying iron, swords, leather, silk, velvet and other textiles to Aden, the Indus and Euphrates. He commented that Quanzhou's silk was unparalleled, and Hangzhou renowned for both glassware and silk.
http://lrrc3.plc.upenn.edu/indianocean/group5/penny05.html; Shen

Fuwei, *Cultural flow between China and the outside world*, p.159-161.
1161: The invading Jin attacked Hangzhou with 600 warships and 70,000 men, and simultaneous land assaults, but were repulsed with grenades launched by catapult; possibly the first time that gunpowder was used in battle. The Song navy, with only 120 warships and 3,000 men, then defeated a huge Jin armada off the Shandong peninsula.
Louise Levathes, *When China ruled the seas*, p.43-47
early 1160s: Five Sri Lankan ships attacked lower Burma, after the Burmese blocked the overland trade route to Angkor.
Kenneth Hall, *Maritime trade and state development in early Southeast Asia*, p.203-4 & 209, citing a Sinhalese inscription of 1165 about rewarding the perpetrator with land, *Epigraphia Zeylonica*, 3:321, no.34 (Archaeological Survey of Ceylon).
1178: Champa attacked the Khmers by water, having attacked by land in the previous year. A Chinese pilot guided the invaders up the Mekong and the Siem Reap river; they pillaged the capital and killed the king. Jayavarman VII counter-attacked, defeated the Chams in another naval battle, and killed their king.
David Chandler, *A history of Cambodia*, p.59, citing G.Maspero, *Le Royaume de Champa* (Paris, 1928) p.164 & K.485, stele from Phimeanakas, *Inscriptions de Cambodge*, vol.2 p.171
Guangzhou customs officer Zhou Qufei wrote of an island in the west (Madagascar?) from which people 'black as lacquer' with frizzy hair were captured and sold as slaves to Arab countries.
Louise Levathes, *When China ruled the seas*, p.37, citing Zhou Qufei, *Ling wai dai da* (about regions beyond the mountain passes), 1178, per J.J.L. Duyvendak, *China's discovery of Africa*, London Univ, 1949, p. 22.
Zhou Qufei also wrote that Srivijaya now had few goods of its own to sell, and relied on force to compel passing ships to stop at its ports.
Kenneth Hall, *Maritime trade and state development in early Southeast Asia*, p.102, citing Chou Ch'u-fei, *Ling wai tai ta*, noted by Chao Ju-kua and transl. O.W. Wolters, 'A few miscellaneous *Pi-chi* jottings on early Indonesia', *Indonesia* 36 (oct 1983): 56.
1163-1190: During the reign of Xiaozong, the southern Song took to seaborne trade, previously dominated by Arabs and others.

Chinese ships sailed east to Korea & Japan, and west to India, the Persian gulf and the Red Sea. China imported raw materials and luxuries (rare woods, precious metals, gems, spices and ivory), and exported manufactured goods (silk and other cloths, ceramics, lacquerware, copper cash, dyes, books and stationery).
Ann Paludan, *Chronicle of the Chinese emperors*, p142.
1190: Compass first mentioned by a European, Alexander Neckam in *De Naturis Rerum*. The first mention in Arabic writings is approximately 1232.
Robert Temple, *The Genius of China* (from Needham), p.149
C11th-12th: tentative date of the **Pulau Buaya** wreck in Indonesia.
Abu Ridho & Edmund Edwards McKinnon, *The Pulau Buaya wreck: finds from the Song period*, 1998; Roxanna Brown, 'History of shipwreck excavation in Southeast Asia', 2004, http://nsc.iseas.edu.sg/documents/belitung/The%20Belitung%20Wreck/02_brown_040to055.pdf
C12th: A ship about 25 feet long was wrecked near **Taean** in Korea; the cargo included high-quality ceramics.
http://news.bbc.co.uk/1/hi/world/asia-pacific/6915941.stm, http://museum.bu.ac.th/SEP%202007.pdf
C12th: A ship sent by the Burmese king arrived at Weligama in Sri Lanka.
Prof Sia, http://members.tripod.com/~hettiarachchi/port.html
C12th: Sri Lankan king Parakrama Bahu I gathered a fleet at Mahatittha to invade the Pandyan kingdom.
Rohan Jayatilleke, http://www.lankalibrary.com/geo/ancient/ports.htm
C12th: Japanese merchants were trading in China. Japan ceased to mint coins, and bought them from China.
Thuan Luc, http://www.charm.ru/coins/vn/nagasaki.shtml
1150-1200: tentative date of the **Jepara** wreck in Indonesia, which carried ceramics and a 2.5m stone anchor stock from Fujian in China. Coins date the wreck to no earlier than 1130.
http://www.koh-antique.com/jepara/jepara%20wreck.htm; Southeast Asian Ceramics Museum newsletter III/5, Sep-Oct06.
early C13th: The Song navy controlled the seas from Fujian to Japan & Korea, and patrolled China's main rivers. The total number of ships reached 600, the largest of which were 24 feet wide with a

crew of 42. All warships had battering rams, catapults, incendiary weapons, protective screens, and fire equipment.
Louise Levathes, *When China ruled the seas*, p.43
1225: Quanzhou's commissioner of foreign trade noted a Chinese court order banning trade with Java, as the import of pepper was causing excessive outflow of copper cash; Javanese traders avoided the ban by calling their country Sukadana (Su-ki-tan).
Kenneth Hall, *Maritime trade and state development in early Southeast Asia*, p.244, citing F. Hirth & W.W. Rockhill, *Chau Ju-kua: his work on the Chinese and Arab trade in the twelfth and thirteenth centuries, entitled Chu-fan-chi*, St Petersburg, 1911.
1245: Joannes de Plano Carpini was the first of several Franciscan monks to chronicle their China travels. William of Rubruck followed in 1253, Giovanni di Monte Corvino in 1294, and Odoric of Pordenone in 1318.
Donald Wigal, *Historic Maritime Maps*, p38-39; John of Monte Corvino, *Report from*
China 1305, http://www.fordham.edu/halsall/source/corvino1.html; Charles
Carlson http://atimes.com/atimes/Central_Asia/EH28Ag02.html
1247: A fleet from Ligor under Candrabhanu attacked Sri Lanka from Kedah (and again in 1270).
http://www.sabrizain.demon.co.uk/malaya/hindu.htm
mid-C13th: estimated date given Nov 2015 for the merchant ship referred to as '***Nanhai-1***', initially said to be Southern Song dynasty (1127-1279). The wreck was found at a depth of 24m near Yangjiang in Guangdong province, preserved to the upper deck. The hull and cargo were raised as a unit, and are now being excavated in the purpose-built Maritime Silk Road Museum of Guangdong, where the work can be viewed from the public galleries. The recovered hull is 30.4m long, 9.8m wide, and 4.8m high. The ship was fully laden with export ceramics from three provinces: Jiangxi (Jingdezhen), Zhejiang (Longquan) and Fujian (Dehua etc). Quanzhou is a possible port of origin, and some ceramics have patterns suggesting that the target market was in the Middle East. The cargo is estimated at 60-80,000 items. Other finds to date include jade statues of Avalokitesvara and arhats; a gold belt, rings and other gold ornaments of designs unknown in China; gold leaf; bronze bracelets; 130kg silver; lacquer objects; a 3-metre granite

anchor stock weighing 420kg, and over 10,000 copper coins, the latest being from the Shaoxing reign (1131-1162).
http://indianasarah.com/nihao-nanhai-one/; http://mp.weixin.qq.com/s?__biz=MjM5ODI3NzkzOQ==&mid=402616452&idx=1&sn=24ca94120952db406c0a663d15b7ce0b&scene=1&srcid=0111al619qX4MhzsGwWlJLD8 (Jan 2016 article in Chinese with many pictures); http://www.chinadaily.com.cn/china/2009-09/28/content_8743828.htm; http://china.org.cn/english/culture/222723.htm; http://news.xinhuanet.com/english/2009-06/21/content_11575992.htm; http://news.xinhuanet.com/english/2007-12/22/content_7296095.htm;http://www.chinadaily.com.cn/china/2007-12/22/content_6341437.htm; http://news.xinhuanet.com/english/2007-05/06/content_6062746.htm; http://english.peopledaily.com.cn/200303/06/eng20030306_112821.shtml; http://www.chinaheritagenewsletter.org/articles.php?searchterm=001_maritimesilk.inc&issue=001; video - locating the bow, http://english.cntv.cn/program/cultureexpress/20110427/104523.shtml; Zhang Wei, 'L'Archéologie sous-marine en Chine', *Taoci*, 2001.

from mid C13th: Japanese became notorious for smuggling and piracy around Korea.

K.Nomoto & K.Ishii, 'A historical review on ships of Japanese tradition', p.100

Song dynasty (960-1279): Guangzhou was China's largest foreign trade port during the Song dynasty; many copper coins were exported.

Guangzhou museum caption.

Song records describe detailed customs inspections at Cham ports, where one fifth of each commodity was collected for the Cham king before remaining goods could be sold. Concealed goods were confiscated.

Kenneth Hall, *Maritime trade and state development in early Southeast Asia*, p.183, citing Georges Maspero, *Le royaume de Champa*, Paris, 1928, p.29.

A ship's hull discovered under an old wharf at Ningbo was roughly

dated to the Song dynasty.
Lin et al, 'Waterfront excavations at Dongmenkou, Ningbo'.
Southern Song dynasty (1127-1279): reported date of the **Huaguangjiao I** wreck found in the Xisha islands southeast of Hainan province, 20 metres long and carrying over 10,000 ceramic pieces from Fujian and Guangdong kilns.
http://www.chinaculture.org/gb/en/2007-05/17/content_98069.htm; http://www.chinadaily.com.cn/photo/2007-05/09/content_868756.htm; http://www.apollo-magazine.com/features/630196/part_4/porcelain-raised-from-the-sea.thtml; http://museum.bu.ac.th/May06.pdf; Zhang Wei, ed, *The Xisha Islands Underwater Archaeology Project Report*.
c.1272: An Odd Ball was made at the Chinese court, with representations of land, rivers, oceans, and a grid of lines... latitude & longitude?
http://h-net.msu.edu/cgi-bin/logbrowse.pl?trx=vx&list=H-Asia&month=0511&week=a&msg=x515H1jaKh6%2b9FvwTswQ9Q&user=&pw, citing the Yuan shi 48:999
1273: Yuan China sent the first of four missions to Sri Lanka (Kublai Khan declared himself emperor of China in 1271, although the southern Song were finally defeated only in 1279); the dates were 1273, 1284, 1291 and 1293. In 1293, Sri Lanka sent one mission back.
Prof W.I. Siriweera, http://lakdiva.net/coins/media/cdn_1998.06.21_china_trade.htm
1274: Kublai Khan sent a fleet with 23-28,000 men from Korea to attack Japan, after earlier requests for tribute were refused. The fleet looted Hakata (Fukuoka), but withdrew with heavy losses after a great storm. The locals then built a 20km defensive wall, parts of which have been excavated.
http://www.timesonline.co.uk/article/0,,61-545301,00.html; defensive wall http://www.seinan-gu.ac.jp/university/english/living/mongol/genko.htm
1275-76: The Mongols, with unbeatable cavalry but initially inferior seapower, recruited Song traitors to help them capture port towns. By 1275 they controlled the Yangzi and had confiscated 3,000 boats. Two opportunistic Song merchants supplied a further 500 boats and several thousand crew for the assault on Hangzhou,

which fell in 1276; the boy emperor Gongzong was captured.
Louise Levathes, *When China ruled the seas*, p.48
1276-1279: The Song emperor was dethroned and captured, and replaced by his half brother Duanzong who had been sent to Fujian for safety. The entire court took to the sea, moving gradually southwards as the Mongols advanced. After capturing Guangzhou, the Mongols launched a naval attack, forcing the court further out to sea. The emperor's ship sank in a hurricane; Duanzong was rescued, but died after a further attack (possibly at Lantau island, home to Hong Kong airport); his younger brother became the emperor Bing Di. In 1279 the Mongols again attacked and drove the court to sea. A three week battle ensued. More than 1000 Chinese ships had been chained together line-abreast; over 800 were captured, and 100,000 men died. Bing Di was drowned. 16 Chinese ships escaped, carrying the dowager empress Yang, who drowned herself from grief and was later worshipped as a goddess.
Ann Paludan, *Chronicle of the Chinese emperors*, p146-7.


Model of the Quanzhou ship

1274-77: tentative date of the Song dynasty ship found at **Quanzhou**, a three-masted compartmentalized 34-metre vessel with bamboo sails and rope made of palm, bamboo, rattan and flax. She was returning from Southeast Asia with sandalwood and other fragrant woods, medicinal products (2.4 tonnes in these categories), jewellery, peppercorns, areca nuts, frankincense, ambergris, tortoise shell, coral, copper coins, money cowries, bamboo, and wooden tags tied to the cargo with the name & address of each merchant, including one 'Ali'.
www.pbs.org/wgbh/nova/sultan/archeology.html; Wang Lianmao (ed), *Return to the City of Light*, p.74-80; Quanzhou ship museum artefacts & captions.
1280s: After capturing Quanzhou, the Yuan emperor despatched envoys overseas ten times. Yang Tingbi was sent in 1280 and 1282 to Quilon in Malabar, receiving promises of support from Egyptian traders and Muslim chieftains, and went on to Kenya. By 1286, ten states in Malaya, Sumatra, India and Africa had sent envoys back.

Shen Fuwei, *Cultural flow between China and the outside world*, p.158.

Mongol ship, landing craft & water carrier: drawing in the Takashima museum

1281: Kublai Khan launched a second attack on Japan, with fleets from Korea and China: thousands of ships and 100-140,000 men. A typhoon destroyed most of the invaders. The Japanese named the storms 'winds of god', or 'kamikaze', and assumed they were under divine protection.
The **Takashima ship**, one of hundreds sunk in Imari Bay in Kyushu, has been excavated. She was estimated to be 70m long, and the wood and granite used in her 7m anchor both come from Fujian. Finds include red leather armour, a commander's bronze seal engraved in Chinese and Mongolian, helmets and weapons, mortars for pounding gunpowder, and shrapnel-filled ceramic grenades.
James Delgado, *Khubilai Khan's Lost Fleet: History's Greatest Naval Disaster*; James Delgado, Relics of the Kamikaze, http://www.archaeology.org/magazine.php?page=0301/etc/kamikaze; Jun Kimura, 'Recent survey and excavation on the Mongolian fleet sunk off Japan: the Takashima underwater site', *Bulletin of the Australasian Institute for Maritime Archaeology* (2006), 30: 7-13; Kublai Khan fleet timber analysis 2004, http://www.rpmnautical.org/japan.htm;http://www.h3.dion.ne.jp/~uwarchae/project%20takashima.htm; http://www.japantimes.co.jp/text/nn20111231a7.html; http://www.bbc.co.uk/news/world-asia-pacific-15452071;http://www.japantimes.co.jp/text/nn20111231a7.html; Takashima museum captions.
Muslims from Jambi (in Sumatra) sent an embassy to Kublai Khan. http://home.iae.nl/users/arcengel/Indonesia/100.htm
1282: Mongol general Toa Do (Gogetu) landed in Champa; he seized the capital in 1283, but encountered fierce resistance. In 1285 Mongols took control of the Red River delta, but were evicted. Nguyen Khac Vien, *Vietnam: a long history*, p.45-48.
-1284: A Chinese celadon bowl and two white Ding bowls were found at Yapahuwa in Sri Lanka, which was destroyed and

abandoned in 1284.
John Carswell, *Blue & White: Chinese porcelain around the world*, p.63, citing Carswell, 'China & Islam in the Maldive islands', *Transactions of the Oriental Ceramic Society*, London, 1978, p.128.
1288: A new Mongol fleet was defeated in the Bach Dang river by Tran Hung Dao, using metal-tipped stakes just as 350 years earlier. 30,000 Mongols died; 100 of their ships were destroyed, and 400 captured. Archaeologists have found wooden stakes of both periods, but as yet no ships.
Le Ti Lien et al,'Understanding the Bach Dang Battlefield from Recent Research Results', www.themua.org/collections/items/show/1266; www.themua.org/vietnam/bdp.php; Nguyen Khac Vien, *Vietnam: a long history*, p.49-50; Hanoi History Museum captions; Dr Trinh Cao Tuong, Institute of Archaeology, personal conversation; Mark Staniforth, 'The lost fleet of Kublai Khan', http://www.latrobe.edu.au/news/articles/2011/podcasts/the-lost-fleet-of-kublai-khan/transcript.
1291-1292: Kublai Khan despatched a princess as replacement bride for the Persian king Arghun, by sea since she had encountered problems on the land journey - escorted by the three Polos, returning home after almost two decades, with messages from the khan for the pope and the kings of Christendom.
Marco Polo, *The Travels*, p.42-43. (See also Frances Wood, *Did Marco Polo go to China?* She argues that the whole account, supposedly dictated in Genoa in 1298, was largely invented. In any case a lot of information came into European circulation, albeit partially garbled.)
1292-1293: Kublai Khan sent 1000 ships to attack Java. Hit by a typhoon, and refused permission to land in Champa, the fleet arrived enfeebled. Vijaya, the ruler of Majapahit, joined the Mongols to attack Kediri, and then launched a surprise attack on the Mongols, who withdrew.
http://home.iae.nl/users/arcengel/Indonesia/100.htm
C12th-13th: tentative date of the **Korang Cina** wreck in Indonesia, and the **North Palawan**, **Bolinao I**, and **San Antonio** wrecks in the Philippines.
Roxanna Brown, 'History of shipwreck excavation in Southeast Asia',

2004, http://nsc.iseas.edu.sg/documents/belitung/The%20Belitung%20Wreck/02_brown_040to055.pdf
C13th: tentative date of a Chinese wreck found at **Kota Cina** in Medan Marelan, Sumatra.
http://www.thejakartaglobe.com/news/ancient-trinkets-unearthed-in-medan/500412; http://www.thejakartapost.com/news/2012/02/24/relics-shipwreck-found-medan.html
C13th: Vietnam's external trade was tightly controlled; goods were exchanged in designated places at ports and border towns. Chinese fabrics were traded for essential oils, ivory, salt and minerals. Javanese and Siamese vessels called at Van Don port. The shipbuilding industry was growing, producing ships with up to 100 oars.
Nguyen Khac Vien, *Vietnam: a long history*, p.36-38.
C13th: Tentative date of a 25m ship among other balangay vessels of this date found at **Butuan** in Mindanao.
http://www.gmanetwork.com/news/story/321334/scitech/science/massive-balangay-mother-boat-unearthed-in-butuan
mid to late C13th: tentative date of wreck found in the **Java Sea** with 190 tonnes of iron (cast iron cauldrons and wrought iron bars), Chinese ceramics, Thai kendis, ivory and aromatics. The ship is of Indonesian wood, and possibly lash-lugged construction, but the cargo appears to have been divided by bulkheads.
Michael Flecker, 'The thirteenth-century Java Sea wreck: a Chinese cargo in an Indonesian ship', http://www.maritime-explorations.com/Java Sea MM.pdf; http://maritime-explorations.com/java%20sea.htm
mid to late C13th: tentative date of the **Breaker Reef junk** off NW Palawan in the Philippines, carrying ceramics from Fujian virtually identical to those of the Java Sea wreck, and copper items. The date was originally estimated by the excavators as late 11th/early 12th century, but has been assessed to C13th on the ceramic evidence.
National Museum of the Filipino People, Manila, artefacts and caption; Southeast Asian Ceramics Museum newsletter III/7, Dec 06; Roxanna Brown, 'History of shipwreck excavation in Southeast Asia',
2004,http://nsc.iseas.edu.sg/documents/belitung/The%20Belitung%20Wreck/02_brown_040to055.pdf

late C13th: tentative date of **Investigador Shoal Junk** wreck, at Kalayaan, Palawan, Philippines. The cargo included celadon and qingbai ceramics, and a large jar with 54kg bronze bracelets under a layer of tea, suggesting illicit trade. China had banned export of all metal.
National Museum of the Filipino People, Manila, artefacts and caption.
c.1300: tentative date of the **Jade Dragon wreck** off the northern-most tip of Borneo, a Southeast Asian lash-lugged ship carrying exclusively Longquan celadon.
http://maritime-explorations.com/jade%20dragon.htm
1309: the gates of the Qingjing mosque in Quanzhou repaired by Ahmad of Jerusalem.
Wang Lianmao (ed), *Return to the City of Light*, p.101
1313: the Italian Andrew of Perugia was despatched by the pope to be third bishop of Quanzhou; he died in 1332.
Wang Lianmao (ed), *Return to the City of Light*, p.115; Quanzhou museum caption.


Model of the Shinan ship, Fukuoka City Museum

1323: a two-masted Chinese ship sank off **Shinan** (or Sinan) in SW Korea. She was 32-36 metres long, 11m wide, about 200 tons, carrying large quantities of Song and Yuan dynasty ceramics and copper coins. Finds included nickel ingots, wooden clogs, and wooden pieces for 'Japanese chess', as well as many wooden cargo tags. The ship was compartmentalised, with wooden water-tanks on both sides amidships. A wooden tag shows that the ship was built in China, by order of the Tofukuji temple in Kyoto (also mentioned is the subordinate Jotenji Tacchu temple in Hakata), left Ningbo in 1323 (3rd year of Shiji), and was bound for Hakata (Fukuoka).
http://www.mm.wa.gov.au/Museum/march/department/oseas.html ; Lee Chang-Euk, 'A study on the structural and fluid characteristics of a rabbetted clinker type ship (the sunken ship salvaged off Shinan)'; John Carswell, *Blue & White*, p.17 (discussing absence of blue and white on the ship, among 5,000 pieces from Jingdezhen, and arguing that production probably started later); http://www.seamuse.go.kr/en/?sub=6&p=2; Fukuoka City Museum captions.Celadon shards found at **Nilaveli** in northeast Sri

Lanka, and thought to be from a ship wreck, are similar to those from Shinan.
John Carswell, 'Two unexplored wrecks of the 14th century in the Red Sea and off Sri Lanka', *Taoci*, 2001.
Song / early Yuan dynasty [1127-1368]: tentative date of the **Bao Jiao I** wreck in China (Dinghai area, Fujian province), which carried many black-glazed tea bowls.
Sarah Kenderdine, 'Bai Jiao I', *IJNA*, 1995.
early Yuan dynasty [1279-1333]: tentative date of the 21-metre ship found at **Xui Zhong** in China (district of San Dao Gang, Liaoning province), carrying iron objects and Cizhou ceramics; the latter are widely found in Japan and Korea.
Zhang Wei, 'L'Archéologie sous-marine en Chine', *Taoci*, 2001.
1316-1330: Franciscan monk Odoric of Pordenone travelled from Venice via Persia and South India to China, and stayed for several years, keeping a diary. Yangzhou was still flourishing (it later silted up). He visited Java, Sumatra and Kalimantan in the 1320s.
Kevin Bishop, *China's Imperial Way*, p.123 &
225; http://home.iae.nl/users/arcengel/Indonesia/100.htm
1328-1339: Wang Dayuan made two trips from Quanzhou on Chinese ships. In 1328-1333 he visited Luzon & Mindanao in the Philippines, many places in Southeast Asia, Sir Lanka and India, and reached Dhofar and Aden. In 1334-1339 he went to Aden, and joined Arab ships to visit north Africa (reaching the Atlantic coast of Morocco) and East Africa (including Mogadishu, and Kilwa in Tanzania). His book includes details on cultures, navigation, and commerce. Indian cotton fabrics were popular in Southeast Asia and Africa. Chinese ships were delivering coloured satin, blue and white ceramics, and ironware to Quilon and Mogadishu; Suzhou and Hangzhou silks to Aden, etc, and were also engaged in entrepot trade of sappanwood, rice, cloves, cardamon, cotton fabrics, ironware etc. A flourishing entrepot trade between India and the Mediterranean was run by merchants from Karami in Egypt, and Muslims dominated an East African trade in gold, ivory and slaves. Promising import items included Aceh horses, cheap Malabar rice, Calicut pepper, ambergris and gold ore from Malindi, and cobalt ore from Mogadishu.
Shen Fuwei, *Cultural flow between China and the outside world*, p.180-187, citing Wang Dayuan's brief account published as a

supplement to *Qing Yuan Xu Zhi* in Quanzhou in 1349, and the full version *Dao Yi Zhi Lüe* published in Nanchang in 1350.
1341-49: Ibn Battuta, who had left Morocco in 1325, spent a few years in India from 1334-41, then travelled on to the Maldives and Sri Lanka, Bangladesh, Sumatra and China. He arrived in Zaiton (Quanzhou) in 1345, and reckoned it one of the five largest ports in the world, along with Calicut and Quilon in India, Sudak in the Crimea, and Alexandria in Egypt. He later visited Fuzhou, Hangzhou and Guangzhou. His travel account was apparently written in 1355. http://www.sfusd.k12.ca.us/schwww/sch618/Ibn_Battuta/Battuta's_Trip_Eight.html & ensuing pages; Frances Wood, *Did Marco Polo go to China?*,
p.145; http://home.iae.nl/users/arcengel/Indonesia/100.htm; Shen Fuwei, *Cultural flow between China and the outside world*, p.179-180 & 186.
1346: John Marignolli, author of *'A Mission to the East'*, visited Quanzhou, noting three magnificent cathedrals, and storage godowns.
Quanzhou museum caption
early C14th: Tentative date of the **Quang Ngai** wreck at Binh Chau village in central Vietnam, a Chinese vessel 20-25m long and 4-6m wide with 12-13 compartments, carrying Chinese ceramics from Longquan and southern kilns. Other artefacts include bronze coins and scale weights. Of three other wrecks found nearby, one salvaged in 2012 is premilinarily reported as C13th, and two salvaged in 2013 as C17th.
Southeast Asian Ceramics Museum Newsletter VI/2-3, Jun13; http://english.vietnamnet.vn/fms/art-entertainment/47953/quang-ngai-blockades-the-shipwreck-with-500-year-old-antiques.html; http://english.vietnamnet.vn/fms/art-entertainment/48238/shipwreck-yields-treasures-dating-from-14th-century.html; http://english.vietnamnet.vn/fms/art-entertainment/65597/quang-ngai-s-shipwreck-to-be-excavated-in-two-months.html; http://english.vietnamnet.vn/fms/art-entertainment/77724/quang-ngai--700-year-old-wreck-found-intact.html; http://english.vietnamnet.vn/fms/art-entertainment/81083/make-or-break-for-ancient-wreck.html; http://vietnamcolors.net/2013/07/the-illuminating-700-year-old-excavation-finds/

Nearby wrecks: http://vietnamnews.vn/life-style/243607/second-ancient-shipwreck-unearthed-in-quang-ngai.html, http://english.vietnamnet.vn/fms/art-entertainment/82375/another-ancient-shipwreck-discovered-in-quang-ngai.html, http://vietnambreakingnews.com/2013/08/more-old-shipwrecks-antiques-found-off-vietnam-central-coast/

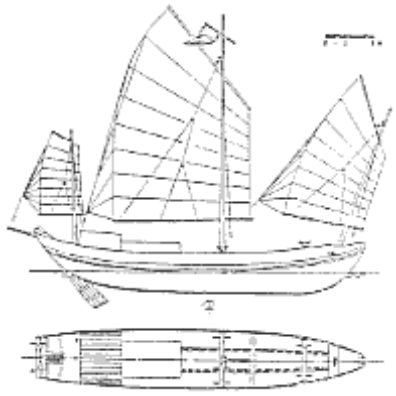
1351: Wu Jian recorded seven mosques in Quanzhou, indicating a sizeable Muslim population.

Quanzhou Maritime Museum caption

Song & Yuan dynasties [960-1368]: From this period, Quanzhou not only has numerous large mosques, important Buddhist temples and Daoist sites, but also the remains of large and exquisitely decorated Hindu temples. It had become a major centre of the Manichaean religion, which originated in Persia in the C3rd and spread along the land silk road. There are many tombstones from the several Muslim cemeteries. There are inscriptions in Arabic, Syrian, Tamil and other languages - and they record embassies to Persia, visitors from Sri Lanka, high official positions held by Muslim residents, etc. The museum has a spectacular large peacock-blue vase from C11-12th Persia. The port was busy, and cosmopolitan.

Wang Lianmao (ed), *Return to the City of Light*, p.103-140; Quanzhou museum artefacts and captions.

1274-1376: tentative date of a narrow 28-metre ship found at Dengzhou in **Penglai** county, Shandong province, and thought to have been a fast naval patrol vessel of 'anchovy' class (named for the shape). Artefacts included a copper blunderbuss, fire-bottles, and other firearms. Yuan Xiaochun & Wu Songgao, 'On the construction of Penglai fighting sailship of Yuan dynasty'; Xi Longfei and Xin Yuanou, 'Preliminary research on the historical period and restoration design of the ancient ship unearthed in Penglai'.



Reconstruction of the Penglai ship. Scale is 5 metres.

Yuan dynasty [1279-1368]: Tentative date of the 21x5metre merchant ship found at **Heze** in Shandong, China. The ship had ten cabins, and carried fine ceramics.

http://english.peopledaily.com.cn/90001/90782/7209838.html; http

://english.peopledaily.com.cn/90001/90783/91324/7210006.html; http://english.peopledaily.com.cn/90001/90783/91300/7208582.html;http://english.peopledaily.com.cn/90001/90782/7146898.html
Yuan dynasty [1279-1368]: Appreciation of Chinese ceramics spread dramatically. The Safavid shahs of Persia and the Ottoman sultans acquired large quantities of Yuan (and later Ming) blue-and-white; large quantities have also been found in Damascus and Fustat (old Cairo), and archaeological evidence of the trade is to be found throughout Asia, the middle East, and east Africa, with a growing number of shipwreck sites supplementing finds on land. In 1349, Wang Dayuan in the *DaoYi Zhi Lue* ('*A brief description of the island foreigners*') listed 45 destinations where Chinese ceramics were in demand, including 18 which preferred blue-and-white to celadon and other types. Recent finds in the Red Sea, apparently from a shipwreck, include Yuan blue-and-white, including large dishes of up to 50cm diameter. Trade and other contacts with Japan continued even during the hostilities: over 220 Japanese monks visited China during the last 75 years of the Yuan dynasty, taking passage on merchant ships; Japanese temples & shrines funded commercial voyages to raise funds for building works.
John Carswell, *Blue & White: Chinese porcelain around the world*, p.13-14, 17, & 62 [citing Grace Wong, 'Chinese blue & white porcelain and its place in the maritime trade of China', in ST Yeo & Jean Martin, *Chinese blue & white ceramics*, Southeast Asian Ceramic Society, Singapore 1978]; & re Red Sea shipwreck p.175-182.; Fukuoka City Museum captions.
mid 14th century: very tentative date of the ***Unisan*** wreck, a Chinese ship wrecked at Tayabas Bay in the Philippines.
http://museum.bu.ac.th/newsletter4.pdf; http://museum.bu.ac.th/newsletter3.pdf
c.1370: tentative date of the '***Turiang***' wreck, a Chinese ship wrecked between Peninsular Malaysia and Borneo with Thai, Vietnamese and Chinese ceramics.
Sten Sjostrand, Roxanna Brown, Claire Barnes: www.maritimeasia.ws/turiang/
1371: The new Ming emperor, Hongwu, banned private overseas trade, after earlier rumblings from 1369.
www.maritimeasia.ws/turiang/ceramicissues.htm#mingban
1377: The kingdom of Majapahit, in Java, sent a navy against

Palembang, in Sumatra, and conquered it. The ruler of Palembang had requested protection from China - which the emperor promised, but his officials arrived too late, and were executed.
http://home.iae.nl/users/arcengel/Indonesia/100.htm
c.1380: tentative date of the '***Nanyang***' wreck, a South-China-Sea ship sunk off the east coast of the Malay peninsula, with Thai & Chinese ceramics, including Thai celadon.
Sten Sjostrand, Roxanna Brown, Claire Barnes: www.maritimeasia.ws/exhib01/pages/p013.html
1383: One of several official missions sent to Southeast Asia by emperor Hongwu carried 13,000 pieces of porcelain as diplomatic gifts.
John Carswell, *Blue & White: Chinese porcelain around the world*, p.79.
1377-1400: tentative date of the 28-metre canal boat found at **Liangshan** in Shandong province, with swords, arrows, and armour.
He Gouwei, 'Measurement and research of the ancient Ming dynasty ship unearthed in Liangshan'.
1380-1400: Tentative date of the **Rang Kwien** wreck in the Gulf of Thailand, with a keel over 25m, carrying Chinese Vietnamese and Thai ceramics, copper ingots, whetstones, and Chinese coins.
Roxanna Brown, 'History of shipwreck excavation in Southeast Asia', 2004, http://nsc.iseas.edu.sg/documents/belitung/The%20Belitung%20Wreck/02_brown_040to055.pdf; Southeast Asian Ceramics Museum Newsletter VI/2-3, Jun13.
1380-1400: Tentative date of the **Song Doc** wreck, carrying early Ming celadon and ceramics from northern Thailand and Vietnam.
Roxanna Brown, 'History of shipwreck excavation in Southeast Asia', 2004, http://nsc.iseas.edu.sg/documents/belitung/The%20Belitung%20Wreck/02_brown_040to055.pdf
C14th or early C15th: tentative date of the **Phu Quoc I** wreck, sunk off Phu Quoc island in southern Vietnam with Thai Sawankhalok ceramics (no Sukhothai ware).
Michael Flecker, 'A preliminary survey of a Southeast Asian wreck', *IJNA* (1994) 23.2: 73-91; http://maritime-explorations.com/phu%20quoc.htm
c.1400: tentative date of the '***Longquan***' wreck, a South-China-Sea ship sunk off the east coast of the Malay peninsula, with Thai &

Chinese ceramics.
Sten Sjostrand, Roxanna Brown, Claire
Barnes: www.maritimeasia.ws/exhib01/pages/p014.html
1402: The city of Melaka, in peninsular Malaysia, was founded by Parameshwara, a rebel prince from Palembang in Sumatra.
http://home.iae.nl/users/arcengel/Indonesia/100.htm
1404: Parameshwara sent an embassy to Beijing, and was promised protection.
http://home.iae.nl/users/arcengel/Indonesia/100.htm
1405: The Commission of Maritime Affairs in Guangzhou authorized construction of the Huaiyuanyi, with 120 rooms to accommodate foreign envoys and merchants.
Maritime Silk Route 1996, p.130, citing the 'livelihood & economy' section of the *Ming shi* (history of the Ming dynasty).

1405-1407: The first naval expedition under admiral Zheng He, on the orders of emperor Yongle, comprised 317 ships with 27,870 men. It sailed to Java, Semudera, Lambri (Aceh), Sri Lanka and Calicut, bearing gifts for local rulers. It routed the forces of pirate chief Chen Zuyi at Palembang. The fleet returned with envoys from Calicut, Quilon, the Sumatran states of Semudera and Aru (Deli), and Melaka - as well as Chen Zuyi, who was beheaded in Nanjing. The expeditions were to be chronicled by Fei Xin, Ma Huan, and others.


Model of a Zheng He 'Treasure Ship'
Quanzhou Maritime Museum

J.V.G.Mills, introduction, p.8-11, to Ma Huan, *Ying-yai Sheng Lan*; Louise Levathes, *When China ruled the seas*, p.75-103.
Geoff Wade, translator, *Southeast Asia in the Ming Shi-lu: an open access*
resource, http://epress.nus.edu.sg/msl/entry/533 & entry/1048.
'Zheng He's sexcentenary', *China Heritage Newsletter* no.2 June 2005, http://www.chinaheritagequarterly.org/articles.php?searchterm=002_zhenghe.inc&issue=002
1407: Siam sent envoys to the Ming court with gifts of elephants, parrots and peacocks.
Geoff Wade, translator, *Southeast Asia in the Ming Shi-lu: an open*

access resource, http://epress.nus.edu.sg/msl/entry/1070; Louise Levathes, *When China ruled the seas*, p.105.
1407-1409: The second Ming expedition, with 249 ships and commanded by Zheng He's subordinates, visited Thailand, Java, Aru, Lambri, Coimbatore, Cochin and Calicut, where it was present for the installation of a new king. A commemorative stone tablet was erected in Calicut. During this voyage, the sultan of Brunei visited the emperor, died in Nanjing, and was buried with imperial honours.
J.V.G.Mills, introduction, p.11, to Ma Huan, *Ying-yai Sheng Lan*; Louise Levathes, *When China ruled the seas*, p.103-6; Ma Huan, *Ying-yai Sheng Lan*.
1409-1411: The third Ming expedition involved 48 ships and 30,000 men, commanded by Zheng He. It visited Champa, Java, Melaka, Semudera, Sri Lanka, Quilon, Cochin and Calicut. A trilingual stone tablet was erected in Galle. The Sinhalese ruler Alakeswara was captured and taken with his entourage to China, where the emperor ordered their release.
J.V.G.Mills, introduction, p.11-12, to Ma Huan, *Ying-yai Sheng Lan*; John Carswell, *Blue & White*, p.87; Louise Levathes, *When China ruled the seas*, p.107-118; Ma Huan, *Ying-yai Sheng Lan*.
Inscription in Galle: http://www.hum.uva.nl/galle/galle/trilingual.htm
Geoff Wade, translator, *Southeast Asia in the Ming Shi-lu: an open access resource*, http://epress.nus.edu.sg/msl/entry/605 & entry/1776 & 1778.
1411: The rulers of Calicut, Cochin, Java and Melaka visited the Ming court.
Geoff Wade, translator, *Southeast Asia in the Ming Shi-lu: an open access resource*, http://epress.nus.edu.sg/msl/entry/1781 & entry/1783, 1784, 1787; Louise Levathes, *When China ruled the seas*, p.118.
1413-1415: The fourth Ming expedition under Zheng He reached the Persian Gulf. With 63 ships and 28,560 men, it visited Champa, Kelantan, Pahang, Java, Palembang, Melaka, Aru, Semudera, Lambri, Sri Lanka, the Maldives, Cochin, Calicut and Hormuz. A splinter group under Yang Min went to Bengal, and returned to China with the new king of Bengal, who presented to the emperor a

giraffe which he had received from the ruler of Malindi (in Kenya). The giraffe was thought to be a mythical *qilin*, and auspicious. On imperial orders to restore the rightful king of Semudera, Zheng He routed the usurper Sekandar, who was taken to China and executed. This was the first of three voyages in which chronicler Ma Huan participated.
J.V.G.Mills, introduction, p.12-13, to Ma Huan, *Ying-yai Sheng Lan;* Louise Levathes, *When China ruled the seas*, p.137-142
Geoff Wade, translator, *Southeast Asia in the Ming Shi-lu: an open access*
resource, http://epress.nus.edu.sg/msl/entry/1902 & entry/2261 & 2229.
1417-1419: The fifth Ming expedition reached Africa. It carried envoys returning home from China, and visited Champa, Pahang, Java, Palembang, Melaka, Semudera, Lambri, Sri Lanka, the Maldives, Cochin, Calicut, Hormuz, Aden, Mogadishu (in Somalia), and Malindi.
J.V.G.Mills, introduction, p.13, to Ma Huan, *Ying-yai Sheng Lan*.
Geoff Wade, translator, *Southeast Asia in the Ming Shi-lu: an open access resource*, http://epress.nus.edu.sg/msl/entry/2336.
c.1400-1420: tentative date of the **Ko Si Chang II** wreck.
Roxanna Brown, 'History of shipwreck excavation in Southeast Asia', 2004, http://nsc.iseas.edu.sg/documents/belitung/The%20Belitung%20Wreck/02_brown_040to055.pdf
1421-1422: The sixth Ming expedition, with 41 ships, returned envoys from Hormuz and elsewhere. It probably visited Melaka, Aru, Semudera, Lambri, Coimbatore, Sri Lanka, the Maldives, Cochin, Calicut, Hormuz, Dhofar, Aden, Mogadishu, Brava and Thailand.
J.V.G.Mills, introduction, p.14, to Ma Huan, *Ying-yai Sheng Lan*; Louise Levathes, *When China ruled the seas*, p.151.
Geoff Wade, translator, *Southeast Asia in the Ming Shi-lu: an open access resource*, http://epress.nus.edu.sg/msl/entry/2768 & 2846.
c.1400-1430: tentative date of the **Phu Quoc II** wreck in southern Vietnam, with Sawankhalok celadon & Sukothai fishplates.
Southeast Asian Ceramics Museum newsletter I/2, Oct04; Roxanna Brown, lecture to the Southeast Asian Ceramic Society, West Malaysia, July 2007; Michael Flecker, personal correspondence, Mar 2014.

c.1420-1430: tentative date of the **Maranei** wreck, a Chinese ship, with the earliest Chinese firearms found on a wreck.
Roxanna Brown, 'History of shipwreck excavation in Southeast Asia', 2004, http://nsc.iseas.edu.sg/documents/belitung/The%20Belitung%20Wreck/02_brown_040to055.pdf
1431-33: The seventh Zheng He expedition was despatched by emperor Xuande. With over 100 ships and 27,550 men, it went to Champa, Surabaya, Palembang, Melaka, Semudera, Sri Lanka, Calicut, Hormuz, Aden, and Jeddah; some participants visited Mecca. Zheng He died on the return voyage.
J.V.G.Mills, introduction, p.14-19, to Ma Huan, *Ying-yai Sheng Lan*; Louise Levathes, *When China ruled the seas*, p.168-173;
Geoff Wade, translator, *Southeast Asia in the Ming Shi-lu: an open access resource*, http://epress.nus.edu.sg/msl/entry/1131 & 1296.
1419-1444: Venetian nobleman Nicolò de Conti left Italy in 1419, lived for a time in Damascus, travelled in South Asia, returned home in 1444, and dictated an account to the papal secretary. He describes five-masted, triple-planked ships 'of twoo thousande Tunnes' with watertight compartments.
J.V.G. Mills, introduction to Ma Huan, '*Ying-yai Sheng Lan*' (The overall survey of the Ocean's shores), p.64-66.
early C15th: Coins of the Yongle reign (1403-1424) fix the earliest date of the **Bakau wreck**, a flat-bottomed Chinese ship wrecked between Sumatra and Borneo with bronze guns and mirrors, copper-alloy tweezers, Thai, Vietnamese and Chinese ceramics.
Michael Flecker, 'The Bakau wreck: an early example of Chinese shipping in Southeast Asia', *IJNA*(2001) 30.2: 221-230; http://maritime-explorations.com/bakau.htm
1456: Thais attacked Melaka by sea, and were repulsed (off Batu Pahat).
http://home.iae.nl/users/arcengel/Indonesia/100.htm, http://www.sabrizain.demon.co.uk/malaya/melaka1.htm
1456: Raja Abdullah of Melaka took Kedah and Pahang from the Thais.
http://home.iae.nl/users/arcengel/Indonesia/100.htm
c.1450-1460: tentative date of the **Ko Khram** wreck.
Roxanna Brown, 'History of shipwreck excavation in Southeast Asia', 2004, http://nsc.iseas.edu.sg/documents/belitung/The%20Belitung%20Wreck/02_brown_040to055.pdf

c.1460: tentative date of the ***'Royal Nanhai'*** wreck, a hardwood South-China-Sea ship wrecked close to the east coast of the Malay peninsula, carrying Thai ceramics and supposed 'diplomatic gifts'. Sten Sjostrand, Roxanna Brown, Claire Barnes: www.maritimeasia.ws/exhib01/pages/p015.html
c.1470: tentative date of the wreck found off **Pandanan** island in the Philippines, which would have travelled from Borneo, and carried both fine and utilitarian ceramics from China, Dai Viet and Champa, and Thailand, plus four antique Yuan pieces at least 100 years older. Finds included glass beads and bronze gongs, a crocodile-tooth pendant, two unusual small cannon, and a copper coin from the reign of Emperor Yongle (1403-24). The central Vietnamese ceramics are from Binh Dinh, around the Cham capital Vijaya, which was sacked by the northern Vietnamese in 1471. Christophe Loviny, *The Pearl Road: Tales of treasure ships in the Philippines*. Asiatype, Philippines, 1996; Allison Diem, 'Vietnamese ceramics from the Pandanan shipwreck excavation in the Philippines', *Taoci*, 2001; Roxanna Brown, 'History of shipwreck excavation in Southeast Asia', 2004,http://nsc.iseas.edu.sg/documents/belitung/The%20Belitung%20Wreck/02_brown_040to055.pdf; National Museum of the Filipino People, Manila, artefacts and captions.
C15th: date of 16,000 fine Chu Dau ceramics recovered from a ?second shipwreck in the same area, **Cu Lao Cham** (the Cham islands) near Hoi An in Quang Nam province. http://english.vietnamnet.vn/fms/art-entertainment/75484/nearly-16-000-antiques-salvaged-from-a-wreck-in-hoi-an.html, http://dtinews.vn/en/news/017/29385/quang-nam-province-divides-treasure-from-sunken-ship.html
C15th: tentative date of some artefacts found with others dated to C12-13th on two wrecks at **Tam Hai** island in Quang Nam province, Vietnam. http://vietnambreakingnews.com/2013/08/more-old-shipwrecks-antiques-found-off-vietnam-central-coast/, http://english.vietnamnet.vn/fms/art-entertainment/83452/800-year-old-antiques-in-shipwreck-in-quang-nam.html
1471: The Cham capital Vijaya was razed by the northern kingdom of Dai Viet. Over forty thousand people were beheaded, and more

than thirty thousand deported. Cham culture never recovered. Menson Bound, 'Aspects of the Hoi An wreck: dishes, bottles, statuettes and chronology', *Taoci*, 2001

c.1470-1487: tentative date of the **Belanakan**, **Prasae Rayong**, and **Ko Si Chang III** wrecks.

Roxanna Brown, 'History of shipwreck excavation in Southeast Asia', 2004, http://nsc.iseas.edu.sg/documents/belitung/The%20Belitung%20Wreck/02_brown_040to055.pdf

1480-1500: tentative date of the compartmentalized ship found on the **Lena Shoal** west of Palawan island in the Philippines, estimated to have been 22 metres long, with a cargo of Chinese, Vietnamese and Thai ceramics, plus bronze gongs, bracelets & cannon, iron & tin ingots, woks, elephant tusks, etc. Some ceramics are similar to products sent to the Middle East, and some are of types found only on Asian sites; the ship's destination is unclear.

Franck Goddio et al, *Lost at sea: the strange route of the Lena Shoal junk*; Franck Goddio, 'La jonque de Lena et le vaisseau *Royal Captain*', *Taoci*, 2001; Monique Crick, 'Les céramiques chinoises, vietnamiennes et thaïlandaises de la jonque de Lena', *Taoci* 2001; http://www.underwaterdiscovery.org/Sitemap/Project/LenaShoal/Default.aspx; National Museum of the Filipino People, Manila, artefacts & captions

1488-1500: tentative date of the junk found off **Santa Cruz** in the northern Philippines. The ship was 25m long and 5.8m wide, built in the Philippines. 15,000 artefacts were recovered in the 2001 excavation, including 11,500 ceramics of excellent quality, with 8,000 intact pieces. Cargo compartments were well preserved. The promised report is eagerly awaited.

http://www.franckgoddio.org/projects/ancient-trade-routes/santa-cruz.html; 2007 lecture to SEACS by Dr Roxanna Brown.

c.1488-1505: tentative date, based on recent ceramic evidence, of the wreck found off Cham island near **Hoi An** in central Vietnam, a South East Asian teak ship (Thai?) with over 240,000 ceramics from northern Vietnam (the Chu Dao kilns of Hai Duong province), China, Champa and Thailand. The excavation director had dated this wreck earlier, at 1435-1470.

Menson Bound, 'Aspects of the Hoi An wreck: dishes, bottles, statuettes and chronology', *Taoci*, 2001; Bui Minh Tri, Tong Trung Tin, Nguyen Quang Liem & Philippe Colomban, 'The Cù Lao Chàm

(Hôi An) shipwreck', *Taoci* 2001; John Guy, 'Vietnamese ceramics from the Hoi An excavation: the Chu Lao Cham ship cargo', *Orientations*, Sept 2000, p125-8; Frank Pope, *Dragon Sea: A true tale of treasure, archeology, and greed off the coast of Vietnam*; Kim Fay, 'Hoi An hoard', www.thingsasian.com/goto_article/article.1196.html; Roxanna Brown, lecture to the Southeast Asian Ceramic Society, West Malaysia, July 2007.

1487-1513: The Portuguese rounded the Cape in 1487-88, reached India in 1498, Sri Lanka by 1506, Melaka in 1509, and China in 1513. Knowledge preceded physical contact: the Cantino Map drawn in Lisbon in 1502 shows the Malay peninsula, Melaka, and the coast of China.

Luis Filipe Barreto, *Cartography of the West-East encounter*, p29,115; Vasco da Gama's account of 1487-8, http://www.fordham.edu/halsall/mod/1497degama.html

1508: The Portuguese ship *Santa Cruz* sank in the Maldives, the first of many European ships to be lost in Asia.

Claudio Bonifacio, Historical list of Spanish & Portuguese shipwrecks in Asia, http://www.arrakis.es/~histres/asia.htm

1509: A Portuguese squadron of five ships under Diego Lopez de Sequeira arrived in Melaka, the first contact of a major European power with the Malay peninsula.

http://www.sabrizain.demon.co.uk/malaya/port.htm

1500-1511: tentative date of the **Brunei** wreck, which carried bronze gongs, glass paste bracelets, about 12,250 Thai Chinese and Vietnamese ceramics including two antique Yuan dynasty pieces around 150 years old, and seven firearms.

Southeast Asian Ceramics Museum newsletter I/3, Nov-Dec04; Michel L'Hour, *La mémoire engloutie de Brunei*; http://foundation.total.com/cultural-heritage/intercultural-dialogue/asian-art/underwater-archaeology-the-discovery-of-the-sunken-treasure-of-brunei-298.html; Roxanna Brown, 'History of shipwreck excavation in Southeast Asia', 2004, http://nsc.iseas.edu.sg/documents/belitung/The%20Belitung%20Wreck/02_brown_040to055.pdf; Roxanna Brown, lecture to the South East Asian Ceramic Society, West Malaysia, July 2007.

1511: Portuguese capture Melaka.

http://www.sabrizain.demon.co.uk/malaya/port1.htm

1512: Javanese counterattack on Melaka repulsed, with the loss of most of their ships.
Lettera di Giovanni da Empoli; The Suma Oriental of Tomé Pires, Hakluyt, Vol.II p282.
1512-1515: The Portuguese traveller Tomé Pires recorded restrictions on Chinese merchants, and the system of tribute to China by Asian kingdoms.
The Suma Oriental of Tomé Pires, Asian Ed.Services p118-119 & 268.
c.1519: The king of Arakan wrote a letter to the Portuguese king inviting trade.
Jacques Leider, '*Elephants slaves and rubies: Arakan's place in the trade network of the Bay of Bengal*', http://www.rakhapura.com/scolumns/arakan_in_tradenetworkofbob.asp
1500-1520: tentative date of the wreck off **Koh Kong** province in Cambodia, which carried Thai and Chinese ceramics.
Southeast Asian Ceramics Museum newsletter III/2, Mar-Apr 06; Southeast Asian Ceramics Museum newsletter V/2, Mar-Apr 08; http://www.phnompenhpost.com/index.php/2009021024126/National-news/Govt-seeks-help-for-shipwreck.html
1500-1520: tentative date of the **Ko Samui** wreck in Thailand.
Roxanna Brown, lecture to the South East Asian Ceramic Society, West Malaysia, July 2007.
1500-1520: tentative date of the **Klang Aow I** (Central Gulf of Thailand, Australia Tide) wreck, with Thai, Vietnamese and Chinese ceramics (no Sukhothai, no Sawankhalok underglaze), and small Chinese hand guns.
Michael Flecker,http://maritime-explorations.com/thailand.htm; Southeast Asian Ceramics Museum newsletter I/2, Oct 04; Roxanna Brown, lecture to the Southeast Asian Ceramic Society, West Malaysia, July 2007.
1521: Ferdinand Magellan, a Portuguese in the service of the Spanish king, reached Guam and the Philippines having sailed westwards from South America, and was killed, but shipmates completed the circumnavigation.
Donald Wigal, *Historic Maritime Maps*, p107-114; account by a Genoese pilot http://www.fordham.edu/halsall/mod/1519magellan.html. See

also '*Was the first man to sail around the world a Malay?*' on Sejarah Melayu, http://malaya.org.uk.
Raja Humabon told Magellan that boatloads of slaves had just left Cebu for Cambodia and
Champa. http://www.gmanetwork.com/news/story/321334/scitech/science/massive-balangay-mother-boat-unearthed-in-butuan
1523: The Portuguese ship *Nazare* sank off Goa; ivory & copper was recovered.
Sila Tripati and Ian Godfrey, Studies on elephant tusks and hippopotamus teeth collected from the early 17th century Portuguese shipwreck off Goa, citing S.J.Stephen, Portuguese Nau
1533: China opened somewhat to Portuguese trade; settlements were precarious until 1557, when a more stable community was organised at Macau.
Joaquim Romero Magalhães, *The Portuguese in the 16th century*, p79-80
1539: A fleet of 160 vessels from Aceh invaded Aru, but was destroyed by Johor, with allies from Perak and Siak, at the battle of Sungei Paneh.
http://www.sabrizain.demon.co.uk/malaya/johor1.htm
1512-1540: tentative date of the wreck found off **Gujangan** (Jolo) island in the southern Philippines, a stitched-plank vessel 18m long carrying Ming blue-and-white ceramics, and no Southeast Asian ceramics. The wreck was discovered by fishermen in 1997, reported in 1998, and excavated in 1999.
Larry Gotuaco, 'Ming in Jolo', *Arts of Asia*, Nov-Dec 2002; Ligaya S.P. Lacsina, 'Traditional island Southeast Asian watercraft in Philippine archaeological
sites', http://www.themua.org/collections/items/show/1231; Roxanna Brown, lecture to the Southeast Asian Ceramic Society, West Malaysia, July 2007. [Dr Brown noted in 2007 that an official report seems unlikely to be published.]
1512-1540: tentative date of the **Klang Aow II** wreck, from which 50-100 fragments of ceramics were excavated in 2004, including Sawankhalok underglaze black, celadon & monochrome white ceramics, and Chinese blue-and-white similar to that on Klang Aow I.
Southeast Asian Ceramics Museum newsletter I/2, Oct04; Roxanna Brown, lecture to the South East Asian Ceramic Society, West

Malaysia, July 2007. Dr Brown noted that the ceramics are now in the National Maritime Museum at Chanthaburi.
1530-1540: tentative date of the ***'Xuande'***wreck, sunk off the east coast of the Malay peninsula with Chinese and Thai ceramics, and small bronze cannon.
Sten Sjostrand, Roxanna Brown, Claire Barnes: www.maritimeasia.ws/exhib01/pages/p016.html; Roxanna Brown, lecture to the Southeast Asian Ceramic Society, West Malaysia, July 2007.
1543: Portuguese arrived in Japan. They established a trading enclave at Hirado.
Joaquim Romero Magalhães, *The Portuguese in the 16th century*, p.81; http://www.hendrick-hamel.henny-savenije.pe.kr/holland3.htm
1544: Chen Kan was despatched as a Ming envoy to Ryukyu. The 5-masted, 15 *zhang* (46.65 metre) ship had been built in Fuzhou. She had 23 compartments, four anchors, four rudders (3 spare), and two boats. She had over 140 crew, and carried over 200 officers, craftsmen and soldiers.
Wang Guanzhou, 'A study of drawings of ancient Chinese ships preserved in Japan', p.122, citing Chen Kan, '*Shi Liu Qiu Lu*' (record of diplomatic mission to Ryukyu) [in Chinese].
c.1550: tentative date of the ***'Singtai'*** wreck, sunk off the east coast of the Malay peninsula; Thai ceramics similar to those on the *'Xuande'* wreck.
Sten Sjostrand, Roxanna Brown, Claire Barnes: www.maritimeasia.ws/exhib01/pages/p017.html
mid C16th: tentative date of the ***San Isidro*** junk wreck on the Zambales coast of the Philippines.
National Museum of the Filipino People, Manila, caption
from mid C16th: Japanese smuggling and piracy became a problem in the Yangtze estuary and southern China.
K.Nomoto & K.Ishii, 'A historical review on ships of Japanese tradition', p.100-101.
1552: The ***São João***, one of the largest Portuguese ships of the time, was wrecked off Natal in South Africa. Survivors trekked north, and a few were rescued. Cargo included Chinese ceramics, and carnelian beads from India.
Tim Maggs, 'The Great Galleon São João: remains from a mid-

sixteenth century wreck on the Natal South Coast', Annals of the Natal Museum 26.1: 173-186 (Dec 1984); Laura Valerie Esterhuizen, 'History written in porcelain sherds', *Taoci*, 2001.
1554: The Portuguese ship ***São Bento*** was wrecked off Natal; survivors found the remains of the *São João*. Cargo included similar ceramics, mostly blue-and-white, carnelian beads, gold jewellery set with Sri Lankan rubies, and money cowries.
Chris Auret & Tim Maggs, 'The Great Galleon SãoBento: remains from a mid-sixteenth century Portuguese wreck on the Pondoland coast', Annals of the Natal Museum 25.1: 1-39 (Oct 1982); Laura Valerie Esterhuizen, 'History written in porcelain sherds', *Taoci*, 2001.
1558: the Portuguese ship ***Espadarte***, returning from China with blue & white porcelain, broke her mast at the Cape and returned to Mozambique where she sank off **Fort San Sebastian**.
Alejandro Mirabal, *Interim Report of the Marine Archaeological Survey performed in Ilha de Moçambique from May to July 2001*, http://www.arq-publications.com/downloads/survey_report2001.pdf; Mensun Bound, 'Exploring the San Sebastian Wreck off Mozambique', *The Explorers Journal*, Summer 2004, http://www.arq-publications.com/downloads/moz_nov2004.pdf; http://www.mercopress.com/vernoticia.do?id=3518&formato=HTML
1565: Andres de Urdaneta sailed across the Pacific Ocean from West to East.
National Museum of the Filipino People, Manila, caption; Robert Bruce Cruikshank, http://blog.360.yahoo.com/blog-yenYfS08eqgwDsnprU8OffaUdTg_?l=246&u=250&mx=250&lmt=5; & index to sailings 1565-1815 http://ManilaGalleon.info.
1569: Mercator published his *'Nova et aucta orbis terræ descriptio ad usum navigantium emendate accommodata'*, the 'New and more complete representation of the terrestrial globe properly adapted for use in navigation', later known as Mercator's Projection. A straight line on this map corresponded to the compass bearing.
Nicholas Crane, *Mercator*, p 204-6.
1571: Spanish soldiers and merchants established themselves at Manila. They also rescued the crew of a sinking Chinese junk and repatriated the crew. In 1572 the rescued merchants returned to Manila and established a long-term trading relationship with the

Spaniards. 'Manila galleons' were Spanish ships sailing from Manila to Acapulco. Galleons sailed in 1572, but returned to Manila in distress; the galleons of 1573 reached Mexico safely.
Edward von der Porten, 'Manila galleon porcelains on the American West Coast', *Taoci*, 2001.
1576: The ***San Felipe*** sailed from Manila & was wrecked off the west coast of Mexico. The 600 shards found in 1999-2000 suggest experimentation by the despatching Chinese merchants, not yet sure of Spanish tastes.
Edward von der Porten, 'Manila galleon porcelains on the American West Coast', *Taoci*,
2001; http://museum.bu.ac.th/newsletter%20jan-Feb.pdf.
1579: The English seafarer Francis Drake and his ship *Golden Hind* spent 36 days at Drake's Bay, 50km north of San Francisco, with porcelain on board after the capture of a Spanish ship. Shards of blue-and-white porcelain found at Drake's Bay have been identified with 77 bowls, plates, cups and bottles from this stay.
Edward von der Porten, 'Manila galleon porcelains on the American West Coast', *Taoci*,
2001; http://www.huffingtonpost.com/2012/03/20/drakes-bay-sir-francis-drake_n_1368693.html
1582: The Portuguese **M1J wreck** off Malacca has been tentatively identified as the ship commanded by Captain Luis Monteiro Coutinho which exploded while fighting an Acehnese fleet.
Michael Flecker, '16th century Portuguese wreck found off Malacca', Heritage Asia Jan-Mar 2007, p.9-15; http://www.maritime-explorations.com/malacca%20strait%20shipwrecks.htm
1587: The *Santa Ana*, a Manila galleon, was captured by the English privateer Thomas Cavendish off Baja California, with a rich cargo of Chinese goods, jewels and bullion.
http://militarymuseum.org/Expeditions.html ; http://cogweb.ucla.edu/Chumash/California_First_Europeans.html; http://math.ucr.edu/ftm/bajaPages/Stories/Coromuel.html
1591: English adventurer Captain James Lancaster visited Penang and the coast of Kedah in the vessel *Edward Bonaventure*.
Sabri Zain, personal correspondence.
1592: Japan introduced a system of foreign trade licences to prevent smuggling and piracy.

K.Nomoto & K.Ishii, 'A historical review on ships of Japanese tradition', p.101.
Japan, led by Toyotomi Hideyoshi who had decided to conquer Ming China, invaded Korea.
Fukuoka City Museum captions.
1595: The Spanish ship *San Agustin* sailed from Manila to Acapulco intending to explore the coast of California, and was wrecked off Point Reyes. Survivors reached Mexico. Shards from 158 porcelains of this date have been identified.
Marco Meniketti, 'Searching for a safe harbor on a treacherous coast: the wreck of the Manila galleon San Agustin'; http://www.ptreyeslight.com/stories/oct16/wreck.html; Edward von der Porten, 'Manila galleon porcelains on the American West Coast', *Taoci*, 2001; http://www.mercurynews.com/breaking-news/ci_20167593/researcher-says-he-knows-site-400-year-old; http://www.huffingtonpost.com/2012/03/20/drakes-bay-sir-francis-drake_n_1368693.htmlThe first Dutch fleet to Asia comprised 4 ships: 3 returned after visiting Java and Bali; the *Amsterdam* was deliberately set on fire near Bawean in Eastern Java.
Menno Leenstra, personal correspondence.
1597: Japan invaded Korea for a second time.
Fukuoka City Museum captions.
1598: Five Dutch fleets sailed for the East Indies via the Cape of Good Hope (eastern route), and two via the Straits of Magellan (western route). Some ships of each fleet returned; collectively they visited Aceh, Banda, Bantam, Ambon, Ternate, Tidore & Manila. Menno Leenstra, http://maritimeasia.ws/topic/firstdutchfleets.html; http://www.vocshipwrecks.nl/out_voyages/hendrik_frederik.html.
mid-late C16th: tentative date of the wreck found at **Puerto Galera** in the Philippines, with dragon jars and other ceramics. http://www.mm.wa.gov.au/Museum/march/department/oseas.html
late C16th: tentative date of the Chinese ship found at **San Isidro** on the W coast of Luzon in the Philippines, with blue-and-white utilitarian ceramics thought to be made in Fujian 1550-1600. http://www.denverartmuseum.org/exhibits/exhibits.cfm?range=Past
1600: The Dutch ship *Liefde* was lost off Kyushu in Japan. Her pilot

was the Englishman William Adams, who came to be trusted by the shogun Tokugawa Ieyasu, and spent the rest of his life in Japan. The shogun sent Captain Quackernaeck and the merchant Van Santvoort to invite their countrymen to trade in Japan. Quackernaeck reached the Dutch settlement at Patani (Thailand) with this message in 1604.
http://www.vocshipwrecks.nl/out_voyages/liefde.html; http://www.geschiedenis.org/deliefde/English.html
The Dutch arrived in the Philippines. Commander Olivier van Noort heard that 400 Chinese ships a year called at Manila, and that two Japanese ships were due shortly, along with the Spanish galleon *San Tomas* carrying silver from Acapulco. The Dutch waited off Manila Bay, preying on merchant ships. The Spanish attacked; during a battle with the small Dutch ship *Mauritius*, which had only 59 men, the ***San Diego*** sank with many of her 450-strong crew. Japanese swords found on excavation suggest the presence of Japanese mercenaries.
http://www.vocshipwrecks.nl/out_voyages/hendrik_frederik.html; http://www.underwaterdiscovery.org/english/events/exhibitions/madridSanDiego.asp; National Museum of the Filipino People, Manila, exhibition
1601: The Japanese shogun, Tokugawa Ieyasu, wrote to Lord Nguyen Hoang of Vietnam about the new licensing system; ships authorized to trade with foreign countries would henceforth carry a red seal. (Between 1604 and 1635, at least 124 red-seal ships visited Tonkin and Cochin-China. A Japanese quarter developed in the port of Hoi An, which already had a Chinese quarter.)
Thuan Luc, http://www.charm.ru/coins/vn/nagasaki.shtml
1602: Five Dutch ships attacked a larger Portuguese fleet blockading Banten in Java, and won a week-long battle. They mapped Jakarta Bay, and went on to the Spice Islands.
Duyfken
history, http://www.mm.wa.gov.au/Museum/march/duyfken/bravship.htm
The Dutch landed at Batticaloa in Sri Lanka.
1605: Xia Ziyang was despatched as a Ming envoy to Ryukyu. This ship had only 3 masts, but like Chen Kan's 5-master sixty years earlier it was 15 *zhang* long and built in Fujian. The original 24 compartments had been divided into 28.

Wang Guanzhou, 'A study of drawings of ancient Chinese ships preserved in Japan', p.122, citing Chen Kan, '*Shi Liu Qiu Lu*' (record of diplomatic mission to Ryukyu) [in Chinese].
1606: The Dutch ship *Duyfken* sailed along the south coast of New Guinea and mapped Australia's Cape York peninsula.
Duyfken
history, http://www.mm.wa.gov.au/Museum/march/duyfken/bravship.htm; http://www.muffley.net/pacific/dutch/ozland.htm
The Dutch allied with Johor to attack Melaka. Dutch and Portuguese fleets fought the battle of Cape Rachado (which is locally known as Tanjong Tuan, but the wrecks are actually west of Port Dickson). The Dutch ships ***Nassau*** and ***Middelburg***, and two Portuguese ships, the ***São Salvador*** and the **galleon of Dom Duarte de Guerra**, were sunk. (The Dutch ship ***Mauritius*** fought in this battle, and sank in 1609 off Gabon.) In October the fleets clashed again off Melaka, when the Portuguese lost and scuttled seven ships.
Transea Sdn Bhd, photo-
essay; *Mauritius* wreck http://www.vocshipwrecks.nl/home_voyages/mauritius.html
The Spaniard Torres encountered 'Moors' in New Guinea, and sailed through the Torres strait dividing that island from Australia.
N. Stevens, ed, *New Light on the discovery of Australia*; C.M.H. Clark, *A History of Australia*, MUP 1999, Vol .I p.9, quoted by the Islamic Council of Victoria, http://www.icv.org.au/history2.shtml
1607: The king of Arakan welcomed Dutch merchants, offering duty-free trade, and solicited their help against the Portuguese, now dominating the ports of Bengal and notorious for piracy and slave-trading. He captured the port of Dianga (20 miles south of modern Chittagong) and massacred several hundred Portuguese, but relations continued in subsequent decades.
D.G.E. Hall, '*The Rise and Fall of the kingdom of Mrohaung in Arakan*', http://www.rakhapura.com/scolumns/r&fofmrauk-u.asp
1608: The VOC representative in Johore reported that Chinese merchant I Sin Ho and his junk were lost at sea: this may possibly be the **Binh Thuan** wreck, off Vietnam to the southwest of Holland Bank, which is otherwise dated to 1573-1643. This well-preserved Chinese ship, 23x7 metres with 24 transverse bulkheads, surviving mast structures and rudder, carried Zhangzhou ceramics and cast

iron pans.
Michael Flecker: '*The Binh Thuan Shipwreck*', Christie's Australia, 2004, http://maritime-explorations.com/BinhThuan.pdf; http://maritime-explorations.com/binh%20thuan.htm.
The Portuguese ship ***Nossa Senhora da Consolação*** was wrecked off Mozambique.
www.arq.de
1611: The Dutch captain Brouwer pioneered a new route, directly east from the Cape of Good Hope for 4,000 miles before turning north, cutting outbound sailing time to Batavia.
http://www.muffley.net/pacific/dutch/ozland.htm but see note: Leenstra
1613: The VOC ship ***Witte Leeuw***, returning from Bantam to the Netherlands with 1,311 diamonds, a sapphire from the king of Arakan, spices, and Ming porcelain, exploded and sank at St.Helena after attacking two Portuguese carracks.
Robert Stenuit, http://www.vocshipwrecks.nl/home_voyages/witte_leeuw.html; Robert Stenuit, 'Les porcelaines du *Witte Leeuw*', *Taoci*, 2001
1615: The VOC ships ***Banda*** and ***Geunieerde Provincien***, returning from Batavia to the Netherlands with Ming porcelain and the retiring governor, sank off Mauritius.
Yann von Arnim & Kate Meileen Li Kwong Wing, *Blue and white china from shipwrecks in Mauritius, Indian Ocean*, Mauritius Museums Council, 2003.
1616: The Dutchman Dirk Hartog visited Western Australia in the ship *Eendracht*, and left an inscription.
http://www.walkabout.com.au/locations/WADirkHartogIsland.shtml
1573-1620: tentative date of the ***'Nan'ao I'*** wreck (formerly known as ***'Nanhai II'***), some 90 feet long and equipped with bronze cannon, carrying more than 10,000 pieces of Ming blue-and-white export ceramics plus ironware and copper coins, off Nanao county, Guangdong province.
http://www.archaeology.org/1109/features/south_china_sea_ming_dynasty_shipwreck.html; http://english.cntv.cn/program/cultureexpress/20110524/102634.shtml; http://life.globaltimes.cn/art/2011-04/648512.html; http://www.globaltimes.cn/content/727768.shtml; http://english.peopledaily.com.cn/90001/90782/90873/6979104.ht

ml; http://news.xinhuanet.com/english2010/china/2010-04/09/c_13244563.htm; http://en.ce.cn/National/culture/201004/09/t20100409_21251633.shtml; http://www.asiaone.com/News/Latest+News/Asia/Story/A1Story20100410-209524.html; http://www.chinadaily.com.cn/china/2009-09/26/content_8739497.htm; http://www.lifeofguangzhou.com/node_10/node_37/node_84/2007/10/16/119249773428614.shtml; http://news.xinhuanet.com/english/2007-06/13/content_6237169.htm; http://museum.bu.ac.th/SEP%202007.pdf

1622: The English East Indiaman *Trial* was wrecked off Western Australia. Survivors reached Batavia.
http://www.muffley.net/pacific/dutch/ozland.htm; http://www.mm.wa.gov.au/Museum/march/department/batavia.html

The VOC yacht *Den Haan* sank near Batavia. A European wreck on the outskirts of Jakarta Bay, 32m long, with six visible iron cannon, Chinese porcelain, and silver bars, is thought to be the *Den Haan*.
Michael Flecker, 'Unreported shipwrecks in Indonesia', *Nautical Archaeology* (newsletter of the Nautical Archaeology Society UK) *2005.4*, p6-7.

The Portuguese flagship ***São Jose*** was sunk by an Anglo-Dutch fleet 'with an infinite wealth' bound for Goa; the accompanying ***Santa Teresa*** was beached and burnt to avoid capture. The two wreck sites have been tentatively identified.
Alejandro Mirabal, *Intermediate Report on Underwater Archaeological Excavations off the Island of Mozambique and Mogincual, from April to November 2005*, http://www.arq-publications.com/downloads/april_november2005.pdf

The Dutch set up a base in the Pescadores (between Taiwan and mainland China), but were later persuaded to move to Taiwan (encouraged by the Japanese, who disliked the presence of the Spanish). They colonized the southwest, importing labourers from Fujian for farms exporting rice and sugar. In 1624 they started construction of Fort Zeelandia on the islet of Tayouan near present-day Tainan.
http://www.npm.gov.tw/exhbition/formosa/english/04.htm, http://www.npm.gov.tw/exhbition/formosa/english/06.htm; Fort Zeelandia http://www.premier.com.tw/Touring/FortZeelandia.htm, http://www.geocities.com/Athens/Styx/6497/formosa.html

1625: estimated date of the ***'Wanli'*** wreck, sunk off the East coast of Peninsular Malaysia. The ship is of European design, carrying Chinese blue-and-white tradeware, one with a Portuguese coat-of-arms. Excavators suggested that the ship may have exploded, perhaps sunk by rivals.
Sten Sjostrand & Sharipah Lok Lok bt Syed Idrus, '*The Wanli shipwreck and its ceramic cargo*',
2007; http://www.thewanlishipwreck.com
1621-27: During the reign of the Ming emperor Tianqi, 'thousands of families of Fujian and Zhejiang provinces are living in the islands of Japan. They marry Japanese people and bring up their future generations there. The settlement is called Tang Street... The ships plying between the two countries are named Tang ships... and most Chinese commodities are sold in Japan.'
Wu Zhenglian, 'The verification of the merchant ships' types in the Sino-Japanese trade from the end of the Ming dynasty to the beginning of the Qing dynasty', p.143, quoting Nan Quyi, '*Ming Tian Qi Shi Lu*' ('Veritable record of the Tianqi reign of Ming dynasty')
1627: The Dutchman Pieter Nuyts in the ship *Gulde Zeepaard* explored the southern coast of Australia.
http://users.senet.com.au/~hitek/holdfastdatasa/Nav.htm.
1628: The Chinese book *Wu Bei Zhi* lists over twenty types of warship used off the coasts of southern China against Japanese pirates.
Tang Zhiba, 'The influence of the sail on the development of the ancient navy', p.62 - citing Mao Yuanyi, '*Wu Bei Zhi*' ('Treatise on armament technology')
1629: The Dutch East Indiaman ***Batavia*** sank on the Abrolhos reef off Western Australia.
http://www.mm.wa.gov.au/Museum/march/department/batavia.html; http://www.muffley.net/pacific/dutch/ozland.htm
1630: The Portuguese ship ***São Gonçalo***, returning from Goa, sank near Plettenberg Bay in South Africa while undergoing repairs. Artefacts at the associated camp site include Chinese and European ceramics.
Jane Klose, Oriental Ceramic Society (UK) newsletter no.11, Jan 2003, citing A.B. Smith, 'Excavations at Plettenberg Bay, South Africa of the camp-site of the survivors of the wreck of the *São Gonçalo*, 1630', *The International Journal of Nautical*

Archaeology 1986, 15.1, p53-56.
early C17th: tentative date of the Portuguese wreck at **Sunchi Reef** off Goa, which carried Chinese ceramics, elephant tusks, and hippopotamus teeth.
Sila Tripati, A.S. Gaur, Sundaresh, 'Exploration of a Portuguese shipwreck in Goa waters, western coast of India'; Sila Tripati and Ian Godfrey, 'Studies on elephant tusks and hippopotamus teeth collected from the early 17th century Portuguese shipwreck off Goa'
1632: Moghul emperor Shah Jahan attacked the Portuguese at Hugli; the king of Arakan helped the Portuguese from Dianga to destroy the Moghul fleet, and discussed with the Portuguese viceroy at Goa an alliance to invade Bengal.
D.G.E. Hall, '*The Rise and Fall of the kingdom of Mrohaung in Arakan*', http://www.rakhapura.com/scolumns/r&fofmrauk-u.asp
1633: The Dutch attacked Xiamen, but were repulsed by the forces of local warlord Cheng Chih-Lung.
http://www.npm.gov.tw/exhbition/formosa/english/04.htm
1636: Japan closed her borders. Between 1592 and 1636 some 400 licensed Japanese ships had sailed to Southeast Asia, where a number of Japanese settlements had been growing rapidly. In the early years Chinese ships were bought or chartered, and European navigators often hired; from about 1630 Japan was building her own ships of hybrid design, but only pictures in temples remain.
K.Nomoto & K.Ishii, 'A historical review on ships of Japanese tradition', p.97,101
Foreign traders in Japan were restricted to the artificial island of Dejima, in the bay of Nagasaki.
http://batavia.rug.ac.be/Japan/Desjima.htm; http://www1.city.nagasaki.nagasaki.jp/dejima/en/01_e.html
1641-83: During this 42-year period, 1171 cargo ships sailed from China to Japan. Chinese ships exported raw silk, textiles, porcelain and sugar to Japan; goods exchanged included gold, silver, copper and sulphur.
Wu Zhenglian, 'The verification of the merchant ships' types in the Sino-Japanese trade from the end of the Ming dynasty to the beginning of the Qing dynasty', p.143, citing Lin Ren Chuan, '*Sino-Japanese private maritime trade from end of Ming dynasty to beginning of Qing dynasty*', Hua Dong Normal University Press, 1937 [in Chinese].

1638: The Spanish galleon ***Nuestra Senora de la Concepcion*** sank off Saipan while heading from Manila to Acapulco, with a cargo of late Ming blue-and-white, goods from around Asia including storage jars from Vietnam and Thailand, and fine gold jewellery of European style made in the Philippines.
Michael Flecker, http://maritime-explorations.com/concepcion.htm, Govt of Guam drawing on National Geographic http://ns.gov.gu/galleon/
1642: The Dutch explorer Abel Tasman sailed to Tasmania (which he named Van Diemen's land), New Zealand, Tonga and Fiji.
http://pacific.vita.org/pacific/dutch/tasman.htm
1656: The Dutch ship ***Vergulde Draeck*** was wrecked off Western Australia.
http://www.museum.wa.gov.au/collections/maritime/march/shipwrecks/Metro/verdra/vergulded.html; http://members.iinet.net.au/~tjv/public_html/voc/vergulde.html; http://www.vocshipwrecks.nl/out_voyages3/vergulde_draak.html
1658: Qing warships defeated Russian invaders at the mouth of the Songhua river in Heilongjiang. More battles followed at Yakesa in 1685-6.
Xi Longfei, 'Recovery of warships used inYakesa battles during Qing dynasty', p.257
1659: The Dutch East Indiaman ***Avondster*** (originally English, captured off Persia in 1653) sank in Galle harbour in Sri Lanka.
Maritime Lanka, http://www.hum.uva.nl/galle/avondster/story.html
1661-2: The Ming admiral Zheng Chenggong (Koxinga), having failed to recapture Nanjing from the invading Manchus, besieged the Dutch at Fort Zeelandia with a force of over 25,000 men and 400 ships, evicted them from Taiwan, and established Han Chinese rule over the island. (Chinese newspapers in 2002 reported the possible discovery of one of these ships off Fujian.)
Wang Lianmao (ed), *Return to the City of Light*, p.89; http://www.iacc.com.tw/newsletters/april%202003/april%202003.htm; http://www.zamboanga.com/html/history_Koxinga.htm; description of fort http://www.npm.gov.tw/exhbition/formosa/english/05.htm; terms of surrenderhttp://www.npm.gov.tw/exhbition/formosa/english/07.htm

1663: The Dutch sent a fleet, which failed to recapture Taiwan, but helped the Manchus (Qing dynasty) to expel Ming forces from Amoy (Xiamen) and Quemoy - temporarily. Control fluctuated until 1680, when Koxinga's son abandoned the mainland and retreated to Taiwan.
http://taiwanresources.com/info/history/chrono.htm
1666: Moghul forces attacked Dianga, decimated the Arakanese fleet, after years of conflict, and annexed the district of Chittagong. D.G.E. Hall, '*The Rise and Fall of the kingdom of Mrohaung in Arakan*', http://www.rakhapura.com/scolumns/r&fofmrauk-u.asp
1670: The Dutch established a fort at Dindings (Pulau Pangkor) with a small flotilla to blockade the coast of Perak in the Malay Peninsula.
http://www.sabrizain.demon.co.uk/malaya/dutch4.htm
1673: A fleet of 75 warboats from Jambi in Sumatra sacked the Johor capital of Batu Sawar.
http://www.sabrizain.demon.co.uk/malaya/johor1.htm
1683: After a fierce sea battle in the Pescadores, Qing forces captured Taiwan.
http://taiwanresources.com/info/history/chrono.htm
1685: The first British outpost in the East Indies was established at Bencoolen in Sumatra.
http://www.sabrizain.demon.co.uk/malaya/straits.htm
1690: The Spanish galleon ***Nuestra Senora del Pilar***, built in Cavite, sank off the southwest of Guam.
http://www.maritimeinvestment.com.au/pilar.html
1698: The Portuguese fort at Mombasa fell to besieging Omanis, and the frigate ***Santo Antonio de Tanna***, sent from Goa to the rescue, was sunk.
http://www.diveturkey.com/inaturkey/mombasa.htm
C15-17th: tentative date of the ship with Chinese ceramics found off South Pagai in the **Mentawai** islands to the west of Sumatra. One report mentions VOC.
http://politic2011.blogspot.com/2011/03/treasure-seeker-voc-ship-aims-mentawai.html; http://www.thejakartapost.com/news/2011/02/09/govt-plans-recover-centuriesold-sunken-ship-mentawai.html; http://www.thejakartaglobe.com/home/booty-laden-sunken-vessel-found-in-mentawai-waters/412155; http://us.en.vivanews.com/news/read/193859-

indonesia-tsunami-draws-ancient-wreck-ashore
1690-1700: tentative date of the *lorcha* (Chinese-built ship with Portuguese-style hull, compartments, and Chinese rigging) sunk off **Vung Tau** in south Vietnam with Jingdezhen blue-and-white and other regional cargo, apparently bound from China to Batavia and ultimately destined for the Dutch market.
Michael Flecker, *IJNA* (1992) 21.3: 221-244; http://maritime-explorations.com/vung%20tau.htm; Christiaan J.A.Jörg & Michael Flecker, *Porcelain from the Vung Tau wreck: The Hallstrom Excavation*; Christiaan J.A.Jörg, 'The porcelain of the Vung Tau junk', *Taoci*, 2001.

Abbreviations:
BEFEO: Bulletin de l'École Française d'Extrême-Orient (Hanoi, Saigon, Paris)
BSOAS: Bulletin of the School of Oriental and African Studies (London)
IJNA: The International Journal of Nautical Archaeology (UK)
JA: Journal Asiatique (Paris)
JMBRAS: Journal of the Malaysian Branch of the Royal Asiatic Society (Kuala Lumpur, Singapore)
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Yann von Arnim & Kate Meileen Li Kwong Wing, *Blue and white china from shipwrecks in Mauritius, Indian Ocean*. Mauritius Museums Council, 2003. ISBN 99903-22-17-1.
Luis Filipe Bareto, *Cartography of the East-West encounter*. Macau Territorial Commission for the Commemorations of the Portuguese Discoveries, Macau, c.2000.
Peter Bellwood, 'Ancient seafarers', *Archaeology* Vol.50 No.2, Mar/Apr 1997, http://www.archaeology.org/9703/etc/specialreport.html
Amira Bennison, 'The Great Caliphs: the golden age of the 'Abbasid empire', I.B.Tauris & Co, London, 2009. ISBN 978-1-84511-737-5.
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Bui Minh Tri, Tong Trung Tin, Nguyen Quang Liem & Philippe Colomban, 'The Cù Lao Chàm (Hôi An) shipwreck, *Taoci* (annual review of the Oriental Ceramic Society of France) no.2, Dec 2001, p.105-110. La Société Française d'Étude de la Céramique Orientale. ISBN 2-86805-102-2.
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Notes:

Menno Leenstra: re 1611 entry on the (southern) Brouwer route from the Cape to Strait Sunda, www.muffley.net/pacific/dutch/ozland.htm states that the voyage was shortened from a typical 16-18 months to 6 months. This is misleading. (The very shortest travel time on the southern route has been compared to the time used by ships taking part in naval actions on the East-African coast or stopping for months in Madagascar or Mauritius.) The normal travel time on the southern route was 8-9 months (see 'Dutch Asiatic Shipping': I). Normal travel time on the northern route was about a year. On the northern route winds were hardly predictable and for that reason ships were often not able to make the voyage from the Cape (or up to 1645 the refreshing station of St Helena), to the Sunda Strait, within the critical-for-scurvy period of 4-5 months, and so had to refresh at Mauritius or Madagascar, losing a lot of time. However, on the southern route ships were lost on the Australian coast, or had difficulty reaching the Sunda Strait. Severe personnel losses were reported by some ships which took the southern route and also took over a year to reach the Sunda Strait.

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Indus Script hypertexts, ingots on a seafaring boat from Mohenjo-daro. Early users of monsoon winds for navigation -- Sila Tripathi (2017)
https://tinyurl.com/ycq7lmql

Early users of monsoon winds for navigation -- Sila Tripathi (2017)

Abstract. The maritime history of India can be traced back to the Harappan Civilization. Studies suggest that even at that time, monsoon winds and currents assisted in navigation. Recent archaeological exploration and excavations along the Indian margin, Persian Gulf, Red Sea, and coasts of Southeast Asia provide convincing evidence about a maritime network and connections between mariners of India and other parts of the world in ancient times. The author of Periplus of the Erythraean Sea (PES) (60–100 CE) has credited Hippalus (~45 CE), the Greek mariner, with the discovery of monsoon winds and the mid-ocean route to the Indian ports from the Mediterranean. However, archaeological findings of Harappan Civilization, as well as the Vedic and Sangam period texts, suggest that the mariners of India who were trading in the Indian Ocean and adjoining seas had knowledge about monsoon winds much before Hippalus. In this paper, an attempt has been made to demonstrate the fact that knowledge of the monsoon winds was familiar to Indian mariners during the Harappan Civilization as well as in the later period.

Full
text: http://www.currentscience.ac.in/Volumes/113/08/1618.pdf

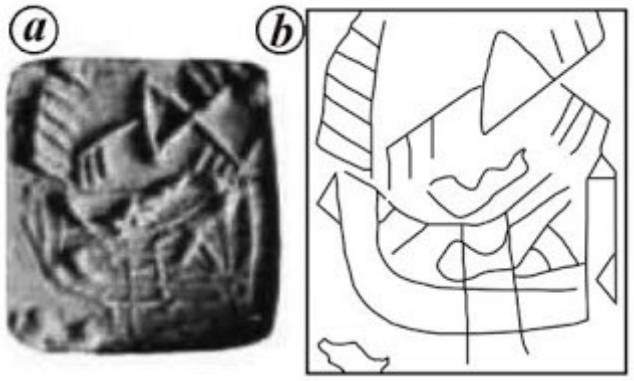

Figure 2. ***a***, ***b***, The Harappan seal depicts a ship with mast and sail recovered from the excavations of Harappa.

Decipherment:

bagalo = an Arabian merchant vessel (Gujarati) PLUS daTo 'claws of **crab**' rebus: dhatu 'mineral' PLUS kolom 'three' rebus: kolimi 'smithy, forge' PLUS **xoli** 'fish-tail' rebus: kolhe 'smelter', kol 'working in iron' PLUS .khareḍo 'a **currycomb**' Rebus: खरड kharaḍ 'scribe' करडा [karaḍā]Hard from alloy--iron, silver &c.; kharādī ' turner' (Gujarati)

See: Evidence of masted sail boat of Mohenjo-daro and Persian Gulf validated by Indus Inscriptions of Supercargo seafaring merchants

Mirror: http://tinyurl.com/j6ojzwd

Fig. 1: Sailing Boat (Mohenjodaro Polished painting, 3000 B.C.) National Museum, New Delhi

A potsherd is a broken piece of ceramic material, especially one found in an Archaeological excavation) of a boat belonging to the Mohenjo-Daro period.) Shows a masted boat of c. 2000 BCE.A planked boat with a steering oar on the quarter and a mast near amidships the evidence of a sailed boat in ancient India. "Masted vessels are depicted in outline on second/first century BCE coins from Chandraketugarh in

Ganges delta and similar vessels are shown on a Sri Lanka monument and on first century BCE terracotta seals. Boats, with planking fitted together with joggles and projections, and fastened by flat, double-dovetail shaped clamps, are depicted on a second century BCE medallion from a monastery at Bharhut, and on the east gate of a first century BCE stupa I at Sanchi in central India. Two-masted ships, with a sheerling rising towards bow and stern, are seen on coins found along the Andhra, Bay of Bengal coast that had been issued by the second century CE Satavahanas. These vessels have a steering oar on each quarter and their shroud-less masts are supported by forestay and backstay. There is also a ship symbol depited on coins found on the Coromandel coast that were issued by the Pallavas in the fourth century CE." (Sean McGrail, opcit., p.52)

See:
Indus Script inscription on a boat with supercargo of ox-hide ingots, Bharhut mint copper, brass, hard alloy ingots
hMirror: http://tinyurl.com/z4duthe

A Bharhut sculptural frieze flanks an elephant rider signifying his palm and flanked by two ox-hide ingot hieroglyphs on both sides of the doorway. There are three other friezes which signify ox-hide ingots as hiereoglyphs flanking doorways.

Indus Script: Supercargo of copper smithywork ingots

The pair of ox-hide ingots which flank doorways on Bharhut scultpural friezes also occur on an Indus Script inscription on Mohenjo-daro prism tablet m1429. The two ox-hide ingots are shown as cargo on a boat flanked by two palm trees and twwo auatic birds.

Hieroglyph: కారండవము [kāraṇḍavamu] n. A sort of duck. కారండవము [kāraṇḍavamu] kāraṇḍavamu. [Skt.] n. A sort of duck. कारंडव [kāraṇḍava] m S A drake or sort of duck. कारंडवी f S The female. karandava [kârandava] m. kind of duck. कारण्ड a sort of duck R. vii , 31 , 21 கரண்டம் karaṇṭam, n. Rebus:
Rebus: *karaḍā* ‘hard alloy’ (Marathi)

(tamar) -- palm tree, date palm rebus: tAmra 'copper' Thus, hard alloy ingot (ox-hide shape) are signified as supercargo.

The other two sides of the tablet also contain Indus Script inscriptions. ayo 'fish' rebus: aya 'iron' ayas metal' PLUS karA 'crocodile' rebus: khAr 'blacksmith' Together, Side 2: kāru ‘crocodile’ Rebus: kāru ‘artisan’. Thus, together read rebus: ayakara ‘metalsmith’.

On side 3 of the tablt, there are 8 hieroglyphic 'signs' signifying the nature of the metalwork involved for the cargo. This is a two part inscription.

Part 1 of the inscription from l.

कर्णक *m. du.* the two legs spread out AV. xx , 133 , 3 rebus: karNI 'helmsman, supercargo'. The hieroglyph of a standing person with legs spread out is thus a semantic determinant of the adjoining hieroglyph: rim of jar: karNika 'rim of jar' rebus: karNika 'scribe, account'. The next two hieroglyphs from the left are a pair of ingots:

dhALako 'ingots' dula 'pair' rebus: dul 'cast metal'. Thus, cast ingots.

Part 2 of the inscription from l.
karNika 'rim of jar' rebus: karNika 'scribe, account'
ayo 'fish' rebus: aya 'iron' ayas 'metal'
kolom 'three' rebus: kolimi 'smithy, forge'
kolmo 'rice plant' rebus: kolimi 'smithy, forge' PLUS circumscript of oval: dhALko 'ingot'. Thus ingot for smithy/forge work.

m1429 Prism tablet with Indus inscriptions on 3 sides.

Slide 24. Moulded tablet, Mohenjo-daro.Three sided molded tablet. One side shows a flat bottomed boat with a central hut that has leafy fronds at the top of two poles. Two birds sit on the deck and a large double rudder extends from the rear of the boat. On the second side is a snout nosed gharial with a fish in its mouth. The third side has eight symbols of the Indus script.

Material: terra cotta.Dimensions: 4.6 cm length, 1.2 x 1.5 cm width Mohenjo-daro, MD 602.Islamabad Museum, NMP 1384.Dales 1965a: 147, 1968: 39

The shape of he boat on the moulded tablet is comparable to the Bronze Age Uluburn ship which had a shipwreck.I suggest that this boat carried a supercargo (rebus: *karNi* Most frequently-occurring hieroglyph on Indus writing corpora: 'rim-of-jar') of copper and tin ingots, based on a rebus

reading of the hieroglyphs on three sides of the prism tablet, including a text in Indus writing, apart from the ligatured hieroglyph of a crocodile catching a fish in its jaws [which is read ayakara 'blacksmith'; cf. *khar* 'blacksmith' (Kashmiri); *karavu*'crocodile' (Telugu); *ayo* 'fish' rebus: *aya* 'metal (tin+ copper alloy)'.

bagalo = an Arabian merchant vessel (Gujarati) *bagala* = an Arab boat of a particular description (Ka.); bagalā (M.); bagarige, bagarage = a kind of vessel (Kannada) Rebus: bangala = kumpaṭi = angāra śakaṭī = a chafing dish a portable stove a goldsmith’s portable furnace (Telugu) cf. bangaru bangaramu = gold (Telugu)

Side B:

karaṇḍa ‘duck’ (Sanskrit) *karaṛa* ‘a very large aquatic bird’ (Sindhi) Rebus: करडा [karaḍā] Hard from alloy--iron, silver &c. (Marathi)

A pair of birds కారండవము [*kāraṇḍavamu*] n. A sort of duck. కారండవము [*kāraṇḍavamu*] *kāraṇḍavamu*. [Skt.] n. A sort of duck. कारंडव [*kāraṇḍava*] m S A drake or sort of duck. कारंडवी f S The female. *karandava* [*kârandava*] m. kind of duck. कारण्ड a sort of duck R. vii , 31 , 21 கரண்டம் karaṇṭam, n. Rebus: karaḍa 'hard alloy (metal)'. *tamar* ‘palm’ (Hebrew) Rebus: *tam(b)ra* ‘copper’ (Santali) *dula* ‘pair’ Rebus: *dul* ‘cast metal’ (Santali)

Rebus readings of the other 2 sides of the Mohenjo-daro tablet:

Side A: *kāru* a wild crocodile or alligator (Telugu) *ghariyal* id. (Hindi)

kāru 'crocodile' (Telugu) கராம் karām, n. prob. grāha. 1. A species of alligator; முதலைவகை. முதலையு மிடங்கருங் கராமும் (குறிஞ்சிப். 257). 2. Male alligator; ஆண் முதலை. (திவா.) కారుమొసలి a wild crocodile or alligator. (Telugu) Rebus: *kāru* 'artisan' (Marathi) *kāruvu* 'artisan' (Telugu) *khār* 'blacksmith' (Kashmiri)

[fish = *aya* (G.); crocodile = *kāru* (Telugu)] Rebus: *ayakāra* 'ironsmith' (Pali)

khār 1 खार् । लोहकारः m. (sg. abl. khāra 1 खार; the pl. dat. of this word is khāran 1 खारन्, which is to be distinguished from khāran 2, q.v., s.v.), a blacksmith, an iron worker (cf. bandūka-khār, p. 111*b,* l. 46; K.Pr. 46; H. xi, 17); a farrier (El.) Side C: Text 3246 on the third side of the prism. *kāḍ* काड् ', the stature of a man' Rebus: खडा [khaḍā] *m* A small stone, a pebble (Marathi) dula 'pair' Rebus: dul 'cast (metal)'shapes objects on a lathe' (Gujarati) *kanka, karṇaka* 'rim of jar' Rebus: *karṇaka* 'account scribe'. *kārṇī* m. 'super cargo of a ship '(Marathi)

Alloy ingots

A pair of ingots with notches in-fixed as ligatures.

ढाल [ḍhāla] *f* (S through H) The grand flag of an army directing its march and encampments: also the standard or banner of a chieftain: also a flag flying on forts &c. ढालकाठी [ḍhālakāṭhī] *f* ढालखांब *m* A flagstaff. (Paras'u?) Rebus: *ḍhālako* = a large metal ingot (G.) *ḍhālakī* = a metal heated and poured into a mould; a solid piece of metal; an ingot (Gujarati). I suggest that the gloss *ḍhālako* denotes the oxhide ingot.

ḍhālako 'large ingot'. खोट [*khōṭa*] 'ingot, wedge'; A mass of metal (unwrought or of old metal melted down)(Marathi) *khoṭ* f 'alloy (Lahnda) Thus the pair of ligatured oval glyphs read: *khoṭ ḍhālako* 'alloy ingots' PLUS dula 'pair' Rebus: dul 'cast metal'.

Forge: stone, minerals, gemstones

khaḍā ‘circumscribe’ (M.); Rebs: *khaḍā* ‘nodule (ore), stone’ (M.) *kolom* ‘cob’; rebus: *kolmo* ‘seedling, rice (paddy) plant’ (Munda.) kolma hoṛo = a variety of the paddy plant (Desi)(Santali.) kolmo ‘rice plant’ (Mu.) Rebus: *kolami* ‘furnace,smithy’ (Telugu) Thus, the ligatured glyph reads: *khaḍā* ‘stone-ore nodule’*kolami* ‘furnace,smithy’. Alternatives: 1. *koṛuŋ* young shoot (Pa.) (DEDR 2149)

Rebus: *kol* iron, working in iron, blacksmith (Tamil) kollan blacksmith, artificer (Malayalam) kolhali to forge.(DEDR 2133).2. *kaṇḍe* A head or ear of millet or maize (Telugu) Rebus: *kaṇḍa* ‘stone (ore)(Gadba)’ Ga. (Oll.) kanḍ, (S.) kanḍu (pl. kanḍkil) stone (DEDR 1298).

kolmo ‘three’ Rebus: *kolami* ‘furnace,smithy’. Thus, the pair of glyphs may denote lapidary work – working with stone, mineral, gemstones.

ayo ‘fish’ Rebus: ayas ‘metal’.

kanka 'rim of jar' (Santali) *karṇika* id. (Samskritam) *Rebus: kārṇī* m. ‘super cargo of a ship ’(Marathi)

कर्णक *m. du.* the two legs spread out AV. xx , 133 , 3 rebus: karNI 'helmsman' करण *m.* writer , scribe W. *m.* a man of a mixed class (the son of

an outcast क्षत्रिय Mn. x , 22 ; or the son of a शूद्र woman by a वैश्य Ya1jn5. i , 92; or the son of a वैश्य woman by a क्षत्रिय MBh. i , 2446 ; 4521 ; the occupation of this class is writing , accounts &c) (Samskrtam) कारणी or कारणीक [kāraṇī or kāraṇīka] *a* (कारण S) That causes, conducts, carries on, manages. Applied to the prime minister of a state, the supercargo of a ship &c. (Marathi) [kárṇa -- , dhāra -- 1] Pa. *kaṇṇadhāra* -- m. ‘ helmsman ’; Pk. *kaṇṇahāra* -- m. ‘ helmsman, sailor ’; H. *kanahār* m. ‘ helmsman, fisherman (CDIAL 2836)

कर्णिक A knot, round protuberance

कारण a number of scribes or कायस्थs W. करण *m.* a man of a mixed class (the son of an outcast क्षत्रिय Mn. x , 22 ; or the son of a शूद्र woman by a वैश्य Ya1jn5. i , 92 ; or the son of a वैश्य woman by a क्षत्रिय MBh. i , 2446 ; 4521 ; the occupation of this class is writing , accounts &c)*m.* writer , scribe W.

karṇadhāra m. ‘ helmsman ’ Suśr. [kárṇa -- , dhāra -- 1]Pa. *kaṇṇadhāra* -- m. ‘ helmsman ’; Pk. *kaṇṇahāra* -- m. ‘ helmsman, sailor ’; H. *kanahār* m. ‘ helmsman, fisherman ’.(CDIAl 2836)

कर्णिक *a.* Having a helm. -कः A steersman.

कर्णिन् karṇinकर्णिन् *a.* 1 Having ears; Av.1.1.2.-2 Long- eared.-3 Barbed (as an arrow). -*m.* 1 An ass.-2 A helmsman.-3 An arrow furnished with knots &c. (Apte)

kāraṇika m. ‘ teacher ’ MBh., ‘ judge ’ Pañcat. [kā- raṇa --]Pa. *usu* -- *kāraṇika* -- m. ‘ arrow -- maker ’; Pk. *kāraṇiya* -- m. ‘ teacher of Nyāya ’; S. *kāriṇī* m. ‘ guardian, heir ’; N. *kārani* ‘ abettor in crime ’; M. *kārṇī* m. ‘ prime minister, supercargo of a ship ’, *kul* -- *karṇī* m. ‘ village accountant ’.(CDIAL 3058)

கருணீகம் karuṇīkam, *n*. **<** *karaṇa*. [T. *karaṇikamu*.] Office of village accountant or karṇam;கிராமக்கணக்குவேலை.
கருணீகன் karuṇīkaṉ , *n*. < id. 1. Village accountant; கிராமக்கணக்கன். கடுகையொருமலை யாகக் . . . காட்டுவோன் கருணீகனாம் (அறப். சத. 86). 2. A South Indian caste of accountants; கணக்குவேலைபார்க்கும் ஒருசாதி.

गांवकुळकरणी (p. 234) [gāṃvakuḷakaraṇī] *m* The hereditary village-accountant: in contrad. from देशकुळकरणी Districtaccountant.
देशकुळकरण [dēśakuḷakaraṇa] *n* The office of देशकुळकरणी.देशकुळकरणी [dēśakuḷakaraṇī]
m An hereditary officer of a Mahál. He frames the general account from the accounts of the several Khots and Kulkarṇ̇s of the villages within the Mahál; the district-accountant.

meḍ ‘body’, ‘dance’ (Santali) Rebus: meḍ ‘iron’ (Ho.)
kāḍ काड् ‘, the stature of a man’ Rebus: खडा [khaḍā] *m* A small stone, a pebble (Marathi)

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