

A Miocene leatherback turtle from the Westerschelde (The Netherlands) with possible cetacean bite marks: identification, taphonomy and cladistics

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Cainozoic Research, 19(2), pp. 121-133, December 2019.

Supplementary Online Material

Appendix 1.

Description of the matrix: characters and changes to the matrix of Wood et al. (1996).

Character description Wood et al. (1996)	Wood nr.	Our nr.	Modified not applicable	Modified extensively
Neural bones present	1	1	no	no
Peripheral bones	2	2	no	no
Pleural bones	3	3	no	no
Shell scuti	4	4	no	no
Medial plastral fontanelle	5	5	no	no
Plastral bones reduced	6	6	no	no
Broad flat ribs	7	-	omitted	omitted
Mosaic of bony shells	8	8	no	no
Anteroposterior ridges or keels	9	9	yes	no
Ridges expressed externally only	10	7 and 19	yes	yes
Ridges arched or tectiform	11	19	yes	yes
Height of separate ridges	12	10	yes	no
Undulating ridge crest	13	11	yes	+ Alabama = 0
Ridges dorsally rounded, viscerally flat	14	7 and 19	yes	yes
Ridges dorsally rounded and viscerally raised	15	7 and 19	yes	yes
Ridges pointed in cross section	16	19	yes	yes
Sunflowers present	17	12	yes	yes
Some ossicles elongated	18	13	yes	no
Ossicles vary greatly in size	19	14	yes	+ <i>calvertensis</i> = 0
Nr of ossicles between ridges less than 2	20	15a	yes	yes
Nr of ossicles between ridges 3 to 5	21	15b	yes	yes
Nr of ossicles between ridges 5 or more	22	15c	yes	yes

Appendix 2.

The new character list.

- 1 'neural bones': 0 = present; 1 = absent
- 2 'peripheral bones': 0 = present; 1 = absent
- 3 'pleural bones': 0 = present; 1 = absent
- 4 'shell consists of scuti': 0 = present; 1 = absent
- 5 'median plastral fontanelle': 0 = small or absent; 1 = large
- 6 'plastral bones reduced to a rod-like peripheral framework': 0 = absent; 1 = present
- 7 'visceral side flat or raised under ridges': - = not applicable; 0 = absent; 1 = present
- 8 'shell composed of a mosaic of small bony ossicles': 0 = absent; 1 = present
- 9 'anteroposterior ridge present on the carapace': - = not applicable; 0 = absent; 1 = ridge present
- 10 'height of separate ridges': - = not applicable; 0 = uneven; 1 = even
- 11 'undulating ridge crests': - = not applicable; 0 = absent; 1 = present
- 12 'clusters of ossicles forming sunflower patterns': - = not applicable; 0 = absent; 1 = big and long; 2 = small and circular [Alabama = ?]
- 13 'some shell ossicles greatly elongated along anteroposterior axis': - = not applicable; 0 = absent; 1 = present
- 14 'ossicles vary greatly in size and shape': - = not applicable; 0 = absent; 1 = present
- 15 'number of ossicles between ridges': - = not applicable; 0 = 1 to 4; 1 = 5 to 17; 2 = more than 17.
- 16 'carapace shape': 0 = convex; 1 = convex between ridges; 2 = concave between ridges
- 17 'Thickness of carapace': 0 = thin scuti; 1 = thick ossicles; 2 = medium thick ossicles; 3 = thin ossicles
- 18 'ossicle size': - = not applicable; 0 = big; 1 = intermediate; 2 = small
- 19 'shape of ridges externally': - = not applicable; 0 = flat; 1 = very low elevation, semi-circular or pointed; 2 = low rounded ridge; 3 = elevated tectiform

Appendix 3.

The new matrix.

Dimensions number of taxa included: 15

Number of characters: 19

Format symbols are: -, 0, 1, 2, 3.

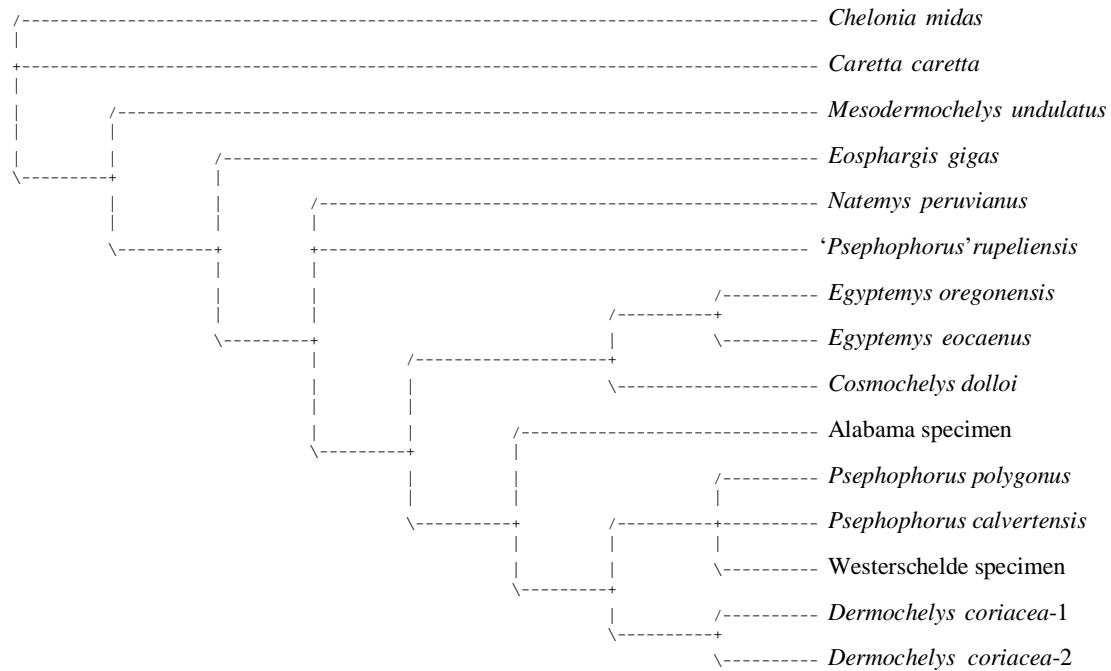
Matrix:

<i>Chelonia midas</i>	00000	0-0--	-----	00--
<i>Caretta caretta</i>	00000	0-0--	-----	00--
<i>Mesodermochelys undulatus</i>	00001	0-0--	-----	00--
<i>Eosphargis gigas</i>	00101	1-0--	-----	00--
<i>'Psephophorus' rupeliensis</i>	11111	10100	0111-	0100
<i>Natemys peruvianus</i>	11111	?0100	0111-	0100
<i>Egyptemys oregonensis</i>	11111	?0111	00010	1211
<i>Egyptemys eocaenus</i>	11111	?0111	00010	1211
<i>Cosmochelys dolloi</i>	11111	?0111	00011	1211
Alabama specimen	11111	?111?	0?01?	1212
<i>Psephophorus polygonus</i>	11111	?1110	12001	1213
<i>Psephophorus calvertensis</i>	11111	?111?	12001	1213
Westerschelde specimen	1111?	?111?	12001	1213
<i>Dermochelys coriacea-1</i>	11111	11110	12012	2313
<i>Dermochelys coriacea-2</i>	11111	11110	12012	2313

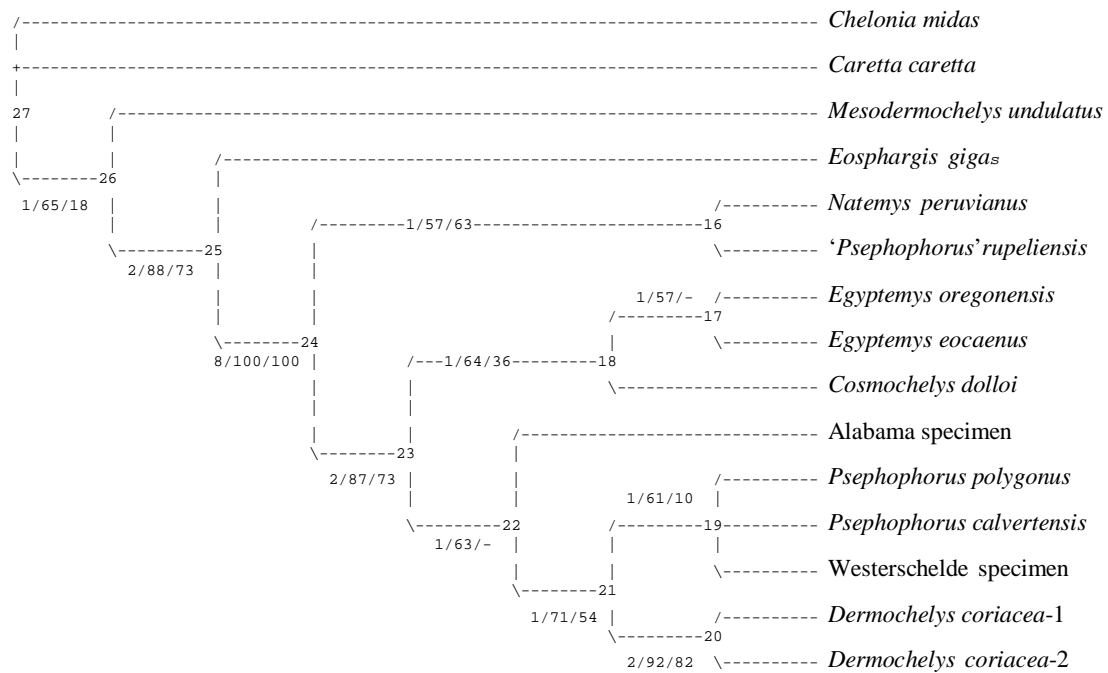
Appendix 4.

Trees.

Tree 1: is equal to the consensus tree.



Tree 2: with Bremer support, bootstrap (1300 replicates) and Jackknife (600 replicates).



Appendix 5.

Character change list of tree 2.

Character	CI	Steps	Changes
1	1.000	1	node 25 0 → 1 node 24
2	1.000	1	node 25 0 → 1 node 24
3	1.000	1	node 26 0 → 1 node 25
4	1.000	1	node 25 0 → 1 node 24
5	1.000	1	node 27 0 → 1 node 26
6	1.000	1	node 26 0 → 1 node 25
7	1.000	1	node 25 - → 0 node 24
		1	node 23 0 → 1 node 22
8	1.000	1	node 25 0 → 1 node 24
9	1.000	1	node 25 - → 0 node 24
		1	node 24 0 → 1 node 23
10	1.000	1	node 25 - → 0 node 24
		1	node 23 0 → 1 node 18
11	1.000	1	node 25 - → 0 node 24
		1	node 22 0 → 1 node 21
12	1.000	1	node 25 - → 0 node 24
		1	node 24 0 → 1 node 16
		1	node 23 0 → 2 node 22
13	1.000	1	node 25 - → 0 node 24
		1	node 24 0 → 1 node 16
14	1.000	1	node 25 - → 1 node 24
		1	node 21 1 → 0 node 19
15	1.000	1	node 24 - → 1 node 23
		1	node 18 1 → 0 node 17
		1	node 21 1 → 2 node 20
16	1.000	1	node 24 0 → 1 node 23
		1	node 21 1 → 2 node 20
17	1.000	1	node 25 0 → 1 node 24
		1	node 24 1 → 2 node 23
		1	node 21 2 → 3 node 20
18	1.000	1	node 25 - → 0 node 24
		1	node 24 0 → 1 node 23
19	1.000	1	node 25 - → 0 node 24
		1	node 24 0 → 1 node 23
		1	node 23 1 → 2 node 22
		1	node 22 2 → 3 node 21

Appendix 6.
Apomorphy lists

Branch	Character	Steps	CI	Change
node_27 → node_26	5	1	1.000	0 → 1
node_26 → node_25	3	1	1.000	0 → 1
	6	1	1.000	0 → 1
node_25 → node_24	1	1	1.000	0 → 1
	2	1	1.000	0 → 1
	4	1	1.000	0 → 1
	7	1	1.000	- → 0
	8	1	1.000	0 → 1
	9	1	1.000	- → 0
	10	1	1.000	- → 0
	11	1	1.000	- → 0
	12	1	1.000	- → 0
	13	1	1.000	- → 0
	14	1	1.000	- → 1
	17	1	1.000	0 → 1
	18	1	1.000	- → 0
	19	1	1.000	- → 0
node_24 → node_16	12	1	1.000	0 → 1
	13	1	1.000	0 → 1
node_24 → node_23	9	1	1.000	0 → 1
	15	1	1.000	- → 1
	16	1	1.000	0 → 1
	17	1	1.000	1 → 2
	18	1	1.000	0 → 1
	19	1	1.000	0 → 1
node_23 → node_18	10	1	1.000	0 → 1
node_18 → node_17	15	1	1.000	1 → 0
node_23 → node_22	7	1	1.000	0 → 1
	12	1	1.000	0 → 2
	19	1	1.000	1 → 2
node_22 → node_21	11	1	1.000	0 → 1
	19	1	1.000	2 → 3
node_21 → node_19	14	1	1.000	1 → 0
node_21 → node_20	15	1	1.000	1 → 2
	16	1	1.000	1 → 2
	17	1	1.000	2 → 3