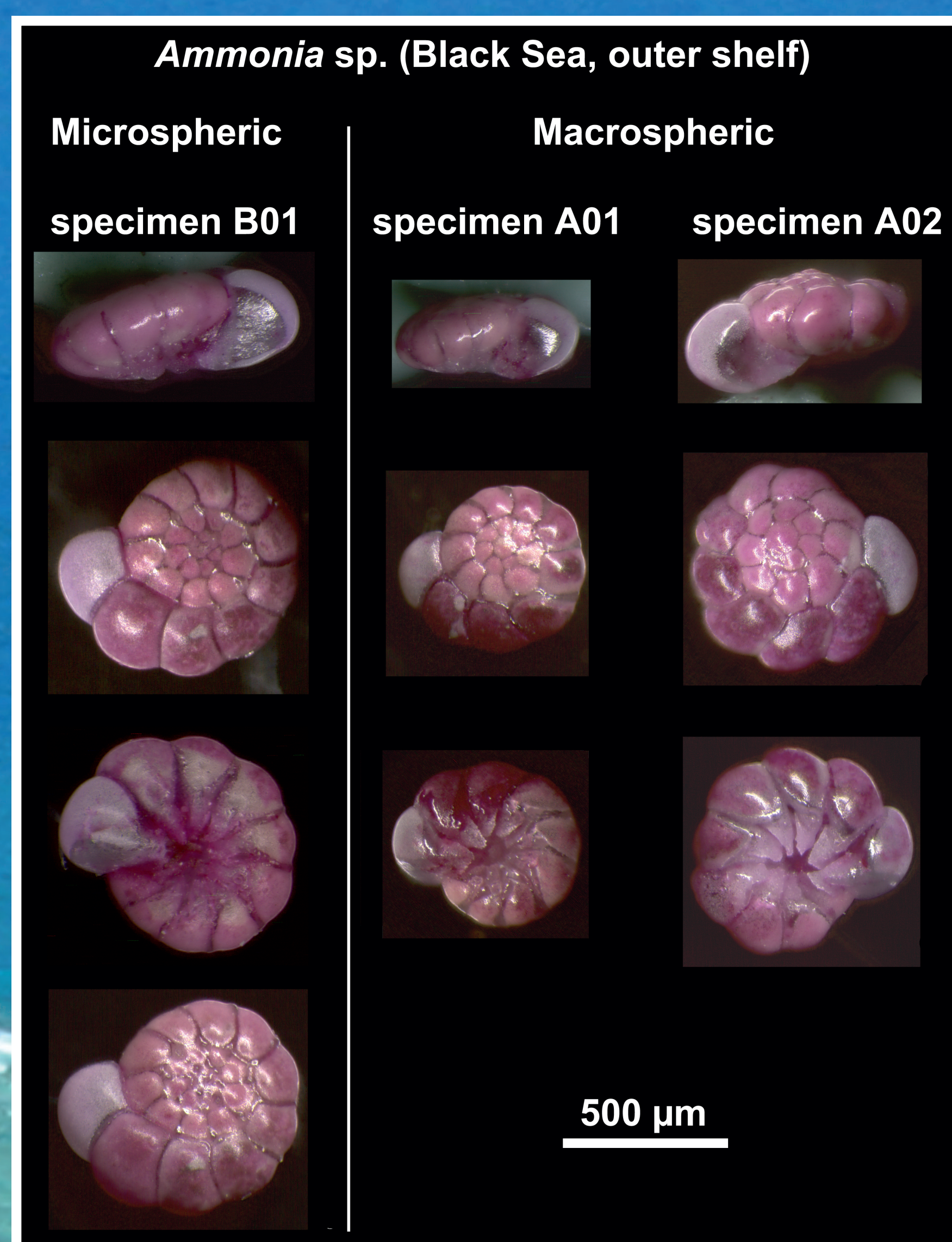


# Mono-, Di-, or Trimorphism in Black Sea *Ammonia* sp.

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**THE QUESTION IS:** what species is the *Ammonia* sp. recovered from the SW shelf off Crimea? We make use of 2625 biometric measures taken from this species for comparison with biometric measures and taxonomic definitions resulting from 35 typus descriptions, or morpho-groups, or molecular groupings, or broad *sensulatu* definitions for members of the genus *Ammonia* (Yanko 1990; Hayward et al. 2004; Leiter & Altenbach 2010).



**OUR RESULTS:** spiral ornamentation and umbilical bosses are inadequate for species separation, as well as the size of proloculi, as it spans one order of magnitude from micro- to macrospheres. The Black Sea *Ammonia* sp. is best defined by separating biometric measures for micro- and macrospheres. Otherwise a mishmash for separate features in A- and B-forms is derived, overprinting most specific peculiarities. It needs a large number of individuals, and an even much larger number of biometric measures, to clearly separate distinct morphotypes. (Our species is near to *Ammonia compacta sensu* Yanko 1990, NOT *Streblus compactus* Hofker, 1964.)

Our biometric methodology in use is outlined here by comparison of *Ammonia* sp. Black Sea and *A. beccarii sensu lato* (Leiter & Altenbach 2010).

Black Sea

number of chambers	n	proloculus [µm]	maximum test size [µm]	maximum test height [µm]	number of whorls
<b>A - forms</b> macrospheres					
4 - 6	9	70 - 100	160 - 230	80 - 120	0.25 - 0.5
7 - 9	13	60 - 100	210 - 320	110 - 170	0.5 - 1
10 - 12	17	50 - 90	280 - 550	130 - 280	1 - 1.5
13 - 15	38	40 - 120	340 - 570	140 - 280	1.25 - 2
16 - 18	32	40 - 90	410 - 620	200 - 340	1.5 - 2.25
19 - 21	17	40 - 100	470 - 820	250 - 400	2 - 2.5
<b>B - forms</b> microspheres					
16 - 18	2	20	210 - 580	90 - 280	2 - 2.5
19 - 21	3	20 - 30	540 - 610	250 - 270	2.25 - 2.5
22 - 24	1	30	580	310	2,5
25 - 27	4	10 - 20	500 - 800	220 - 370	2.75 - 3.25
28 - 30	2	20 - 30	800 - 830	280 - 370	3 - 3.75
31 - 33	2	20 - 30	750 - 910	330 - 430	3.25 - 3.5

number of chambers	n	proloculus [µm]	maximum test size [µm]	maximum test height [µm]	number of whorls
<b>A - forms</b> macrospheres					
13 - 15	2	50-60	230-250	150	1.5-1.75
16 - 18	7	40-60	250-310	130-210	1.5-1.75
19 - 21	3	50-60	300-360	150-190	1.75
22 - 24	6	40-70	250-380	160-240	2-2.5
25 - 27	1	40	380	220	2.25
<b>B - forms</b> microspheres					
28 - 30	1	10	380	220	2.75
31 - 33	1	10	300	170	3
34 - 36	1	10	400	190	3.5

Namibia

Assess <i>Ammonia</i> as a monomorph adult species (e.g. Hayward et al. 2004, and others)						
mixed	n	chambers	proloc	max. size	height	whorls
Black Sea	76	13-32	10-100	210-910	90-430	1.75-3.75
Namibia	19	14-36	10-70	250-400	150-240	1.75-3.5
Better use micro- and macrospheres of all ages, guided by their bimodal proloculi distribution						
A forms	n	chambers	proloc	max. size	height	whorls
Black Sea	125	4-21	40-120	160-820	80-400	0-2.5
Namibia	19	14-27	40-70	230-380	130-240	1.5-2.5
B forms	n	chambers	proloc	max. size	height	whorls
Black Sea	14	17-32	10-30	210-910	90-430	2-3.75
Namibia	3	29-36	10	300-400	170-230	2.75-3.5
Evidence for trimorphism appears at proloculi sizes near 35-45 µm in our Black Sea <i>Ammonia</i> sp. (But it needs an excess of >>100 individuals measured to illustrate).						

Sources: Hayward, B.W., Holzmann, M., Grenfell, H., Pawlowski, J. and Triggs, C. 2004: Morphological distinction of molecular types in *Ammonia* - towards a taxonomic revision of the world's most commonly misidentified foraminifera. *Marine Micropaleontology*, 50: 237-271. Leiter, C. and Altenbach, A.V. 2010: Benthic Foraminifera from the diatomaceous mud-belt off Namibia: characteristic species for severe anoxia. *Palaeontologica Electronica*, 13.2: 1-19. URL: <http://www.micropress.org> [Ellis & Messina Catalogue by the Micropaleontology Press, April 2014] Yanko, V.V. 1990: Chetvertichnie formaniferi roda *Ammonia* v Ponto-Kaspiiskom regione [Quaternary foraminifera of genus *Ammonia* in the Pontic-Caspian Region]. *Paleontologicheskii Zhurnal*, 1:18-26.

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