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1 ***Amoebophrya ceratii***

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14 **SUMMARY** (1004/1000 characters)

15 Dinoflagellates are one of the most abundant and diverse components of marine plankton. Many of

16 them, if not all, are infected by the endoparasitoid *Amoebophrya ceratii* (Syndiniales, Marine

17 Alveolate Group II), an early emerging dinoflagellate group. As these parasitoids frequently display

18 narrow host ranges, they are believed as diversified as their hosts and composed of cryptic species.

19 Infections last 2-4 days and end with the host death and the release of a transient fast-swimming

20 colony (the vermiform) that fragments within a few hours into hundreds of infective cells

21 (dinospores). Due to this exponential growth, *A. ceratii* exerts striking potential on top-down control

22 of planktonic dinoflagellate blooms in natural waters. Both *A. ceratii* and their dinoflagellate hosts

23 share the same common ancestor, a red myzozoan microalga. *A. ceratii* is rather atypical by having

24 lost its plastid and an extremely reduced mitochondrial DNA. It can be co-cultivated with its host but

25 not cryopreserved.

26

27 (1439/1450 characters)

28 **KEY FACTS**

29 *A. ceratii* is haploid, with V-shaped permanently condensed chromosomes during most of its life
30 cycle. Genomes are rather small (hundreds of Mb) compared to other dinoflagellates (~3-245 Gb).
31 Genes are encoded into unidirectional clusters and mRNA are trans-spliced. In two strains, introns
32 were predominantly non-canonicals (differing from the GT-AG motif) and partly composed of
33 introners acting as transposable elements.

34 The OXPHOS pathway, as complex III is missing, breaks the mitochondrial electron transport chain
35 into two independent operating sub-chains.

36 **DISEASE FACTS**

37 Infection occurs either in the nucleus or cytoplasm. Once inside the host, *A. ceratii* nutrition mode
38 starts with osmotrophy and then shifts to phagotrophy. Pre-digested host chromosomes are sucked
39 into feeding tubes and consumed in food vacuoles.

40 During the infection, the host is “zombified”: it still swims, with functional mitochondria and
41 chloroplasts despite the complete digestion of its nucleus. The energy produced by the host
42 organelles likely benefits the parasitoid.

43 The lifespan of spores is of only a few days. *A. ceratii* is able to enter dormancy simultaneously with
44 its host resting cyst, emerging months later to propagate novel infections.

45 **TAXONOMY AND CLASSIFICATION**

46 **PHYLUM:** Myzozoa

47 **CLASS:** Dinoflagellata

48 **ORDER:** Syndiniales

49 **FAMILY:** Amoebophryidae

50 **GENUS:** *Amoebophrya*

51 **SPECIES:** *A. ceratii* (species complex composed of multiple cryptic species)

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54 were provided by Sophie Lepanse (MERIMAGE platform, Station Biologique of Roscoff) and Gérard
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56 within the Roscoff Culture Collection (RCC).

57 **Declaration of interests**

58 The authors declare no competing interests

59 **Resources**

60 <http://www.aquasymbio.fr/en/amoebophrya-ceratii-species-complex>

61 <https://www.roscoff-culture-collection.org/> (Roscoff Culture Collection)

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