

# Are Ciliate Really Reproduce Sexually?

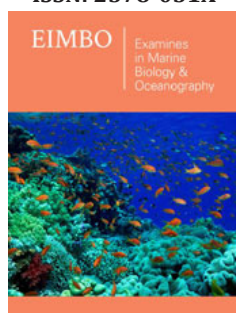
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## Opinion

Ciliates are very ancient and diverse clade of eukaryotes [1] it evolved around 2 billion years ago [2]. Some members of this group are very spectacular model organisms to study the genetics and molecular and developmental biology [3]. Ciliates reproduce both sexually as well as asexually [4]. During favorable conditions when plenty of food is available and ecological conditions are perfect, ciliates reproduce asexually by binary fission but during unfavorable condition when food resources are depleted and ecological conditions are unfavorable, they reproduce sexually through conjugation [5]. But there is a confusion existed between research communities and they have difference of opinion on the nature of conjugation process, either we call it sexual reproduction or not.

### Conjugation is not a mode of sexual reproduction

Those who believe that the process of conjugation is not the sexual reproduction says that, only the single-cell organisms teach us that reproduction and sex are two evolutionarily and functionally distinct phenomena [6]. M. Sleigh in his milestone protozoological book ("Protozoa and Other Prostists" chapter 4 "Reproduction and Sex" 1989) said that all single-cell eukaryotes, reproduce/multiply by binary (or various modalities of multiple) fission, and that only some groups such as ciliates, evolved and can perform sex. While many groups, for example, of amoebas and flagellates ignore sex at all, yet they all reproduce. So, this school of thought believe that we need to avoid the consideration of sexual reproduction in single-cell eukaryotes. Particularly in relation to conjugation of ciliates in which two cells mate, exchange genes and then separate without yielding new-borns, while in multicellular eukaryotes two different partners (male/female) mate in their sexual reproduction exchange germline cells and produce new offspring which is genetically different from their parents [7]. Thus, we can deduce that phenomenon of conjugation is not actually the process of sexual reproduction.

### Conjugation is mode of sexual reproduction

Second group which believe that conjugation is a sexual mode of reproduction also have solid reasoning, NG Stephen regarded the sexual process of ciliated protozoa as equivalent to the sexual reproduction in multicellular organisms and somatic development as embryological phenomenon just resemble the embryogenesis of multicellular organism. According to this, when two ciliate cell of different mating types of conjugate, during fertilization the maternal soma perishes by resorption and replaced by a new embryonic soma, which develop in situ in maternal soma. This release from cytotoxic constraints imposed by the maternal soma are just as yielding of new-born. This new soma is an ontogenetically new individual, different from its maternal soma [8]. Orias E in 3<sup>rd</sup> chapter: Ciliates conjugation of his book, The molecular biology of ciliated Protozoa, describe that "genetically and developmentally, ciliates conjugation shows remarkable analogies to copulation, fertilization and generation of young in multicellular animals" because during conjugation two cells pairs, establish a temporary junction, exchange gene and generate progeny potentially expressing novel phenotypes as a consequence of mendelian segregation and genetic recombination [9]. Majority of studies related to conjugation of ciliates consider this process as sexual reproduction. So, use of word "sexual reproduction" for ciliates conjugation is appropriate.

Because we have described the logical opinion of both school of thoughts, so now we are leaving this on our readers to reach some decision on the bases of logical points described above.

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