Preliminary results on the effect of electromagnetic fields on swimming patterns and the umbrella contraction of the scyphozoan Rhizostoma pulmo

Beatriz Rubio-Tortosa1, Lorena Parra2, Sandra Sendra3, Cesar Bordehore4,5, Jaime Lloret2
1 Dep. Ecology, University of Alicante, Spain
2 Instituto de Investigación para la Gestión Integrada de Zonas Costeras, Universidad Politécnica de Valencia, Spain
3 Signal Theory, Telematics and Communications Department, Universidad de Granada, Spain
4 Ramon Margalef Environmental Research Institute (IEMF) University of Alicante, Spain

INTRODUCTION

Few studies have looked at the effect of induced electromagnetic fields (IEMF) on jellyfish swimming patterns. To explore the hypothesis that IEMF have an impact on jellyfish movements, we exposed individuals of Rhizostoma pulmo to different IEMF frequencies.

METHODS

The frequencies used ranged from 100 kHz to 1000 kHz, increasing 100 kHz per test. The exposure period was 2 minutes for each frequency, with a break of two minutes with no IEMF (controls). We used a cylindrical aquaria (~15 L) and a zenithal video camera (Figure 1). Speed was calculated on 1 s frequency using Tracker software (Figure 2).

RESULTS AND CONCLUSION

The swimming speed of R. pulmo showed that the jellyfish reacted changing speed as a response to some IEMF frequencies. After analysing punctual speed data [ANOVA on Ln (kHz+1)] there were two groups, one with low speed -where the controls were- and a second group with higher speed. The pattern was the following (Figure 3):

1st group with low speed, comprising controls (mean speed $\xi$: 0.22 cm s$^{-1}$) and the frequencies of 400 kHz, 600 kHz, 700 kHz, 800 kHz, 900 kHz and 1,000 kHz with $\xi$ of 0.17 cm s$^{-1}$, 0.15 cm s$^{-1}$, 0.11 cm s$^{-1}$, 0.22 cm s$^{-1}$, 0.28 cm s$^{-1}$ and 0.15 cm s$^{-1}$ respectively.

2nd group with higher speed comprised 100 kHz, 200 kHz, 300 kHz and 500 kHz with $\xi$ of 0.80 cm s$^{-1}$, 0.50 cm s$^{-1}$, 0.40 cm s$^{-1}$, and 0.42 cm s$^{-1}$ respectively.

• Transition from control (0 kHz) to frequencies of the higher speed group showed an acceleration and a deceleration during the control period after such frequencies (linear adjustment in Figure 2).

• In other trials, R. pulmo showed an even lower speed between 800 and 1,000 kHz, slowing down its pulsation rate until reaching a complete stop, after which the jellyfish sank to the bottom. After that, once making IEMF zero, pulsation recommenced after ~10 seconds and its behaviour appeared normal.

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