

Optical Manipulation of Animal Behavior using a Ruthenium-based Phototrigger

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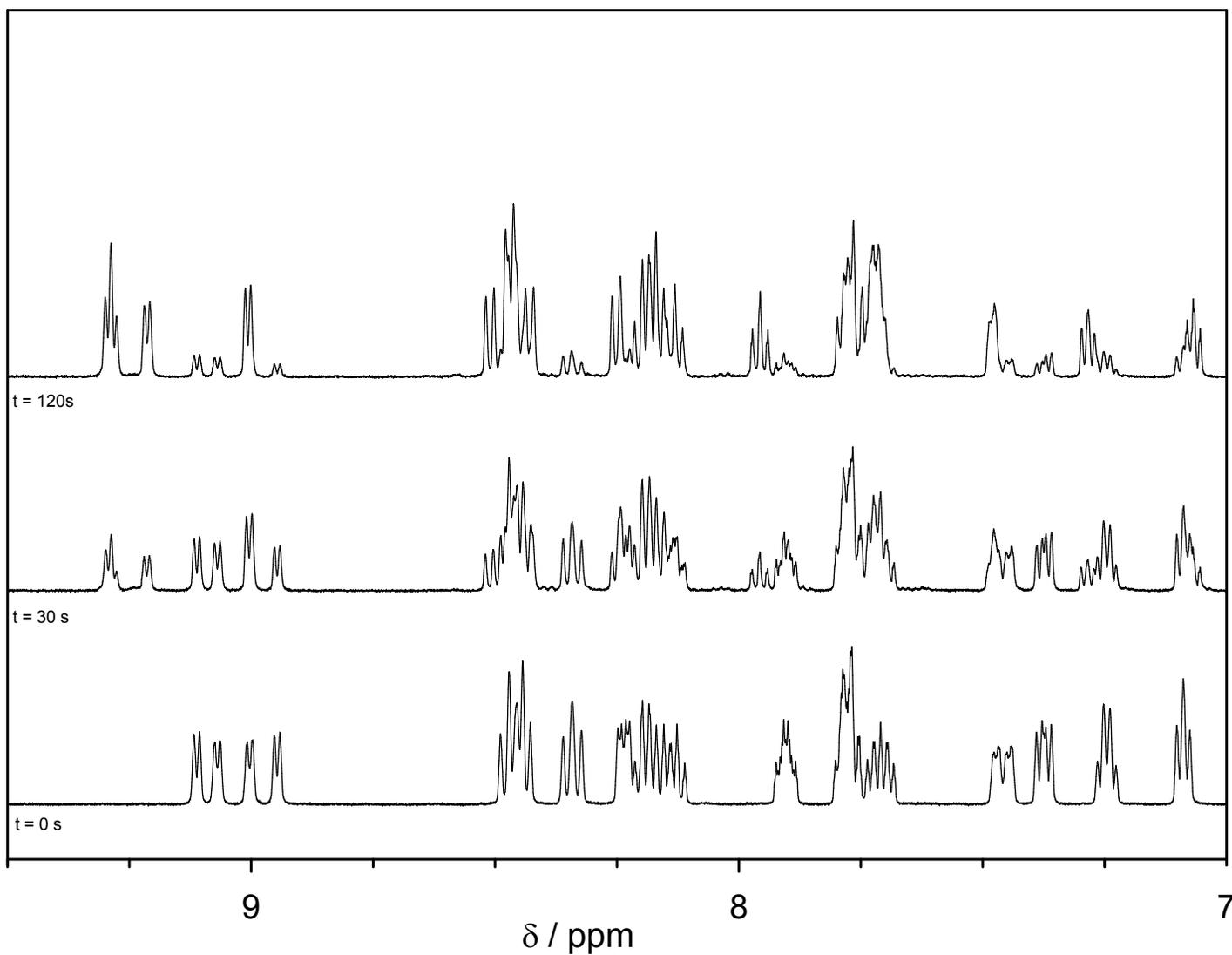


Figure ESI 1: Aromatic part of the ¹H-NMR spectra of Rubi-Arg during direct photolysis inside the NMR tube with 532 nm light in a 5:1 D₂O/Acetone-d₆. The duplication of the initial 16 signals corresponding to the bipyridines corresponds to the fact that two diastereomers are present, since the racemic mixture of Δ-Λ Ru-bpy moiety reacts with the enantiomerically pure L-arginine.

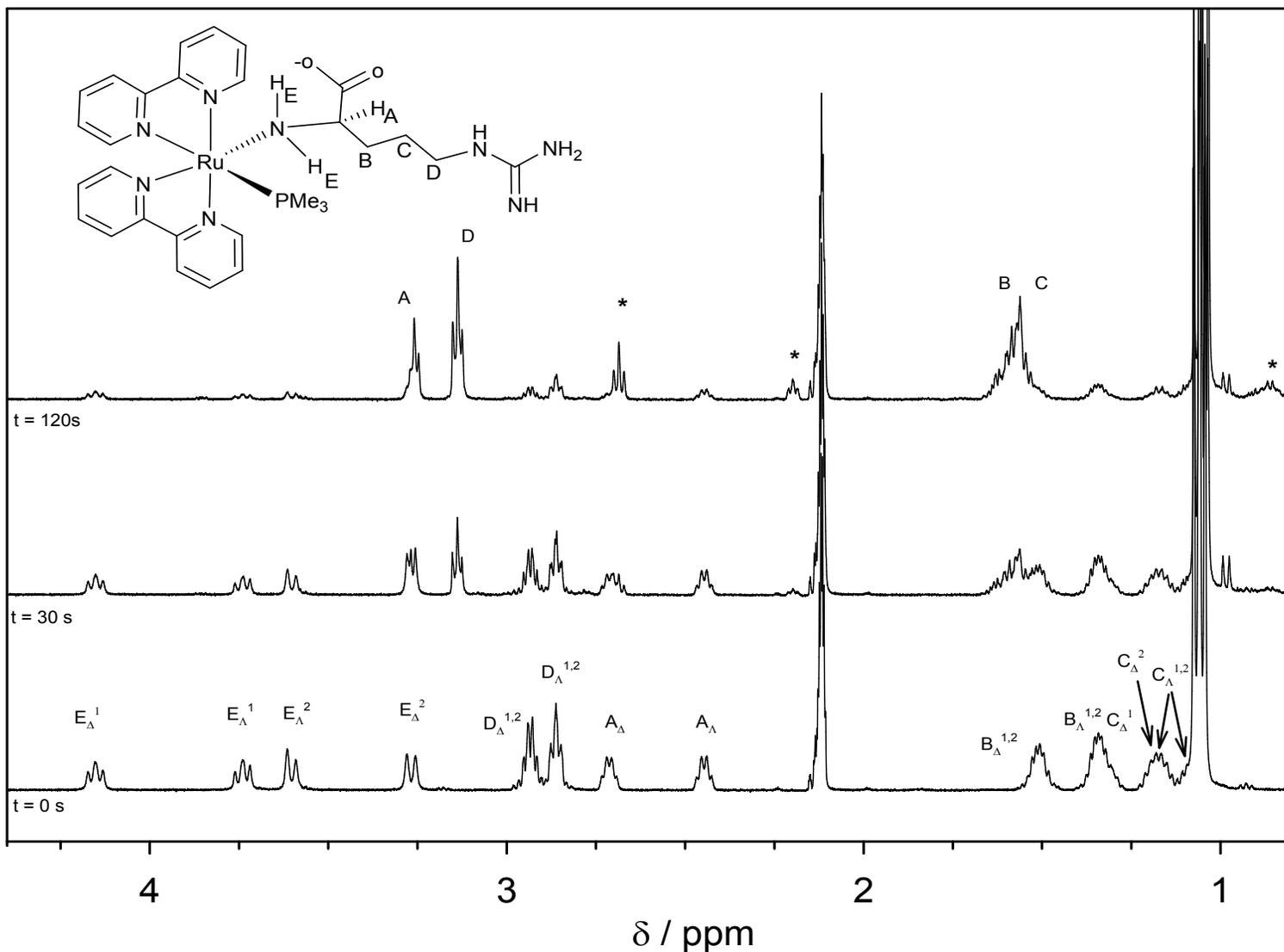


Figure ESI 2: Aliphatic part of the ^1H -NMR spectra of Rubi-Arg during direct photolysis inside the NMR tube with 532 nm light in a 5:1 $\text{D}_2\text{O}/\text{Acetone } d_6$ and the assignment of the hydrogen signals. A, B, C, D corresponds to the free arginine. E is not seen in free arginine due to exchange with D_2O . At $t = 0$ s the signals for the coordinated arginine are shown. Superindexes 1 and 2 refers to the given hydrogen in a methylene, while Δ and Λ subindexes indicates the Ru-bpy diastereomer to which L-Arg is bonded. Tall doublets around 1.05 corresponds to coordinated PMe_3 . Signals at 2.69, 2.20 and 0.87 ppm (asterisks) correspond to the *trans*-Rubi-Arg produced during photolysis.

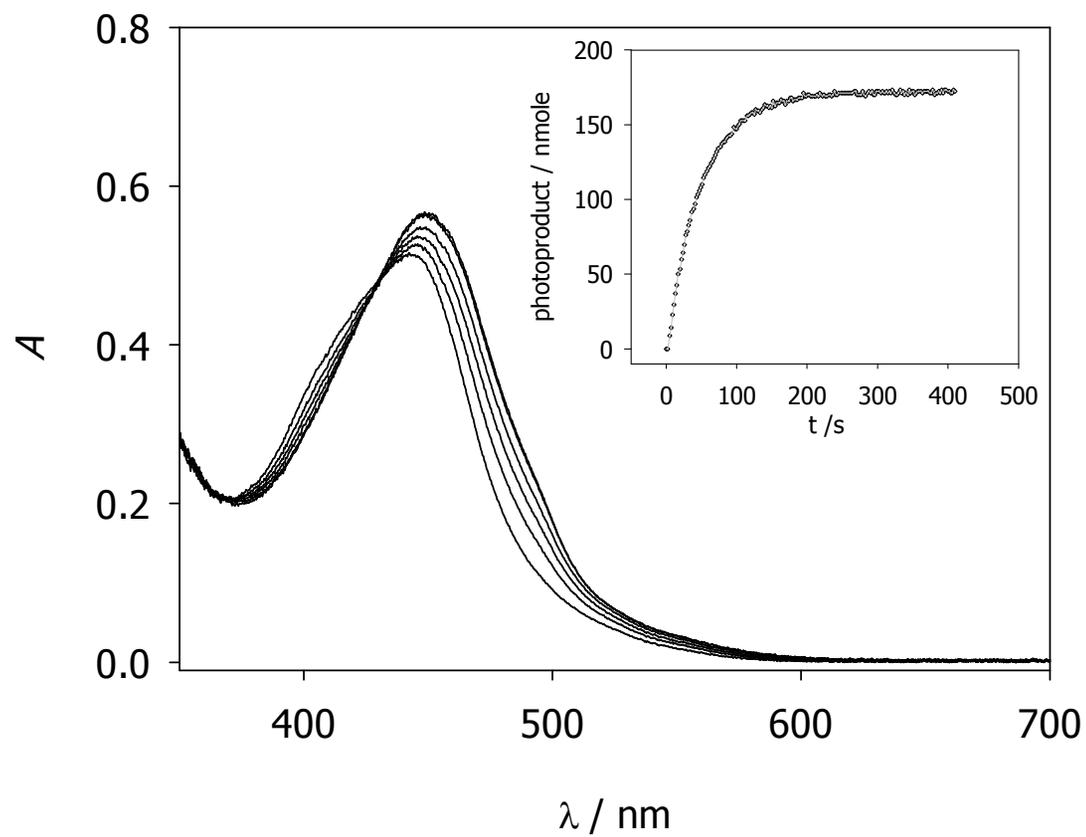


Figure ESI 3: UV-vis spectra of a solution 84 μM RuBi-Arg during photolysis in H_2O ($T=25^\circ\text{C}$, $\text{pH}=7$, $\lambda = 445 \text{ nm}$, $p = 7.48 \text{ mW}$). Inset: moles of products vs. time. Solid line: fitting of Eq.1 for $\phi_{\text{pD}} = 0.18$.

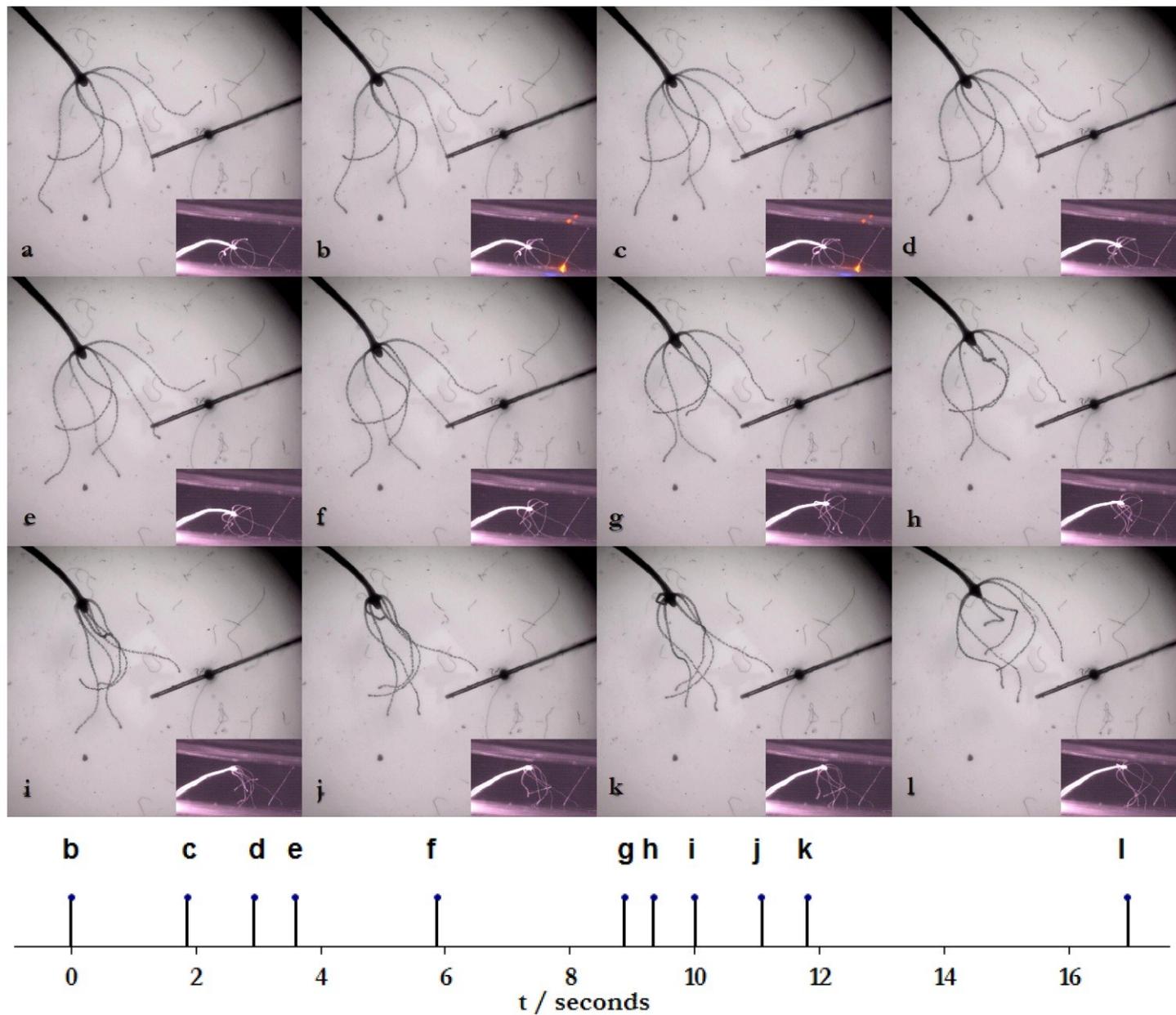


Figure ESI 4: Temporal sequence of elicited feeding response of Hydra by arginine uncaging. a) Before irradiation; b) (t=0) Laser ON; c) tentacle detects chemical ; d) (t=3s) Laser OFF; e,f) hook response; g,h) fast tentacle shrinkage; i-k) others tentacles help feeding; l) release. (This sequence corresponds to video hydra-arg.avi)

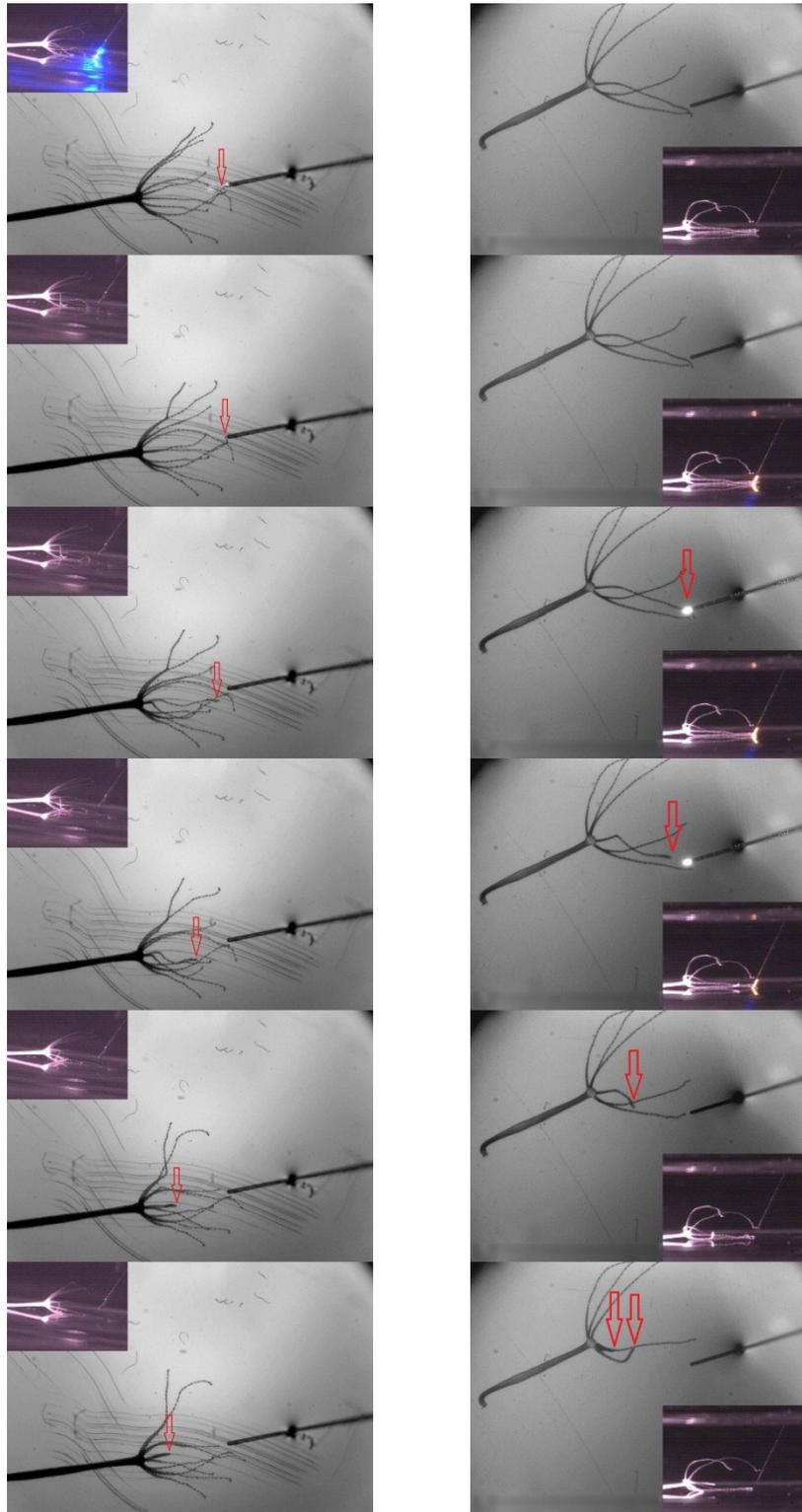


Figure ESI 5:
Left panel:
sequence of
events

(feeding response) triggered by local photolysis of a 77 μM solution of RuBi-Arg. Right panel: same experiment performed at 100 μM RuBi-Arg.

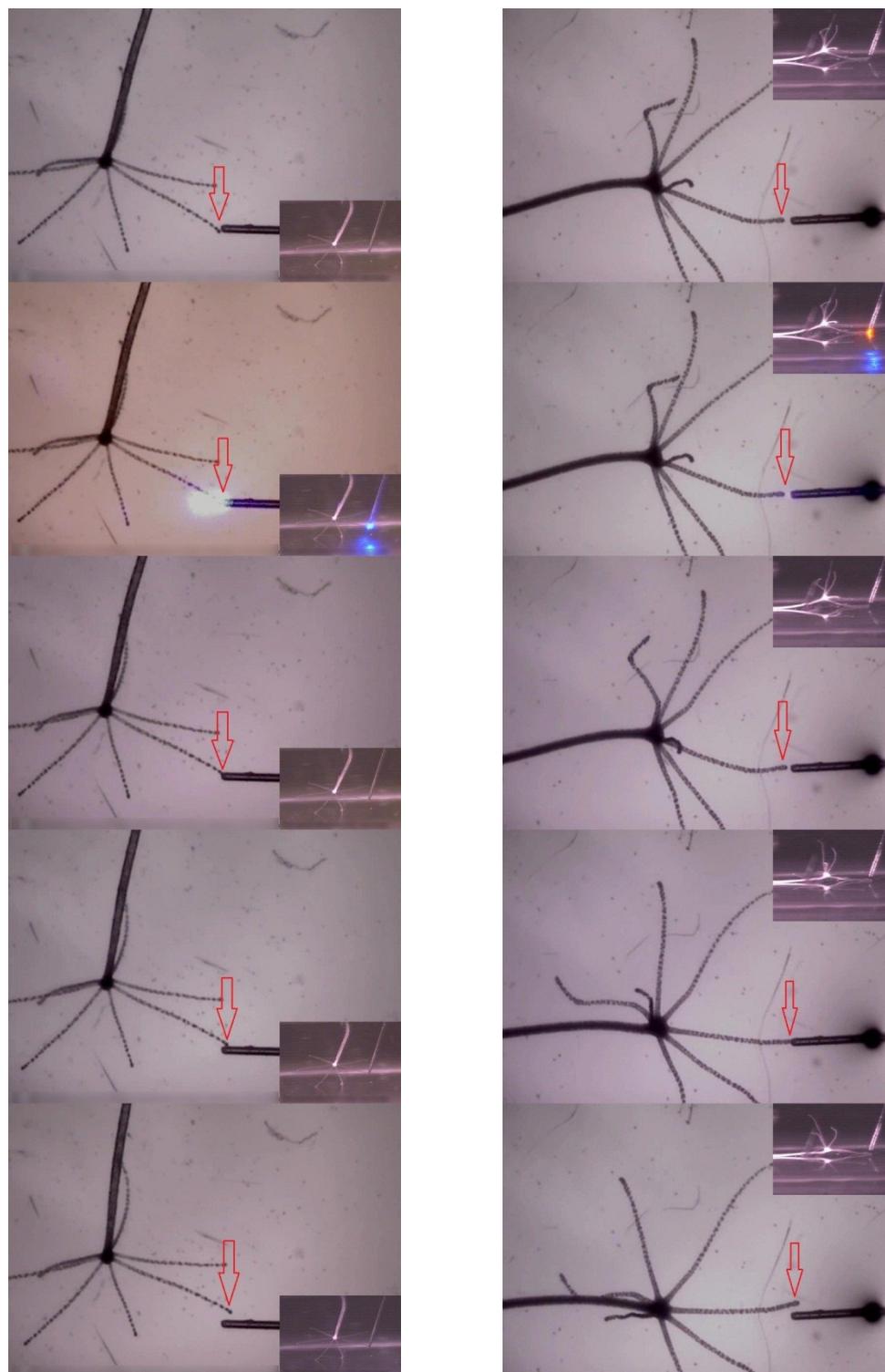


Figure ESI 6: Left panel: sequence of events (no response) after irradiation near a tentacle in a bath containing Hydra artificial freshwater solution. This sequence corresponds to the video Hydra-laser.avi. Right panel: Same experiment using a 1 mM $[\text{Ru}(\text{bpy})_2\text{PMe}_3(\text{H}_2\text{O})]^{2+}$ solution, also showing no feeding response. This sequence corresponds to the video Hydra-aquo.avi.