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Spontaneous chirping in *Apteronotus leptorhynchus*

Alexandre Pratt, Benjamin Elliott, Leonard Maler

Department of Cellular and Molecular Medicine, University of Ottawa, ON

Abstract

Brown ghost knife fish (*Apteronotus leptorhynchus*) is a weakly electric fish that can briefly increase its electric organ discharge (EOD) frequency to produce electrocommunication signals termed chirps. Previous experiments have shown that *Apteronotus leptorhynchus* occasionally “chirps” without stimulation when electrodes first enter the forebrain. Previous work has failed to address the reason for this chirping without stimulation.

By stimulating various regions of the forebrain and matching the resulting change in EOD frequency to the frequency observed in previous experiments it would be possible to identify the region of the forebrain responsible for these particular chirps.

Objective

- The goal of this study was to identify which region of *Apteronotus leptorhynchus* forebrain is responsible for producing the spontaneous chirps observed in previous experiments

Figure 1. Schematic electric organ discharge waveform (left) and spectrum (right) in *Apteronotus leptorhynchus*

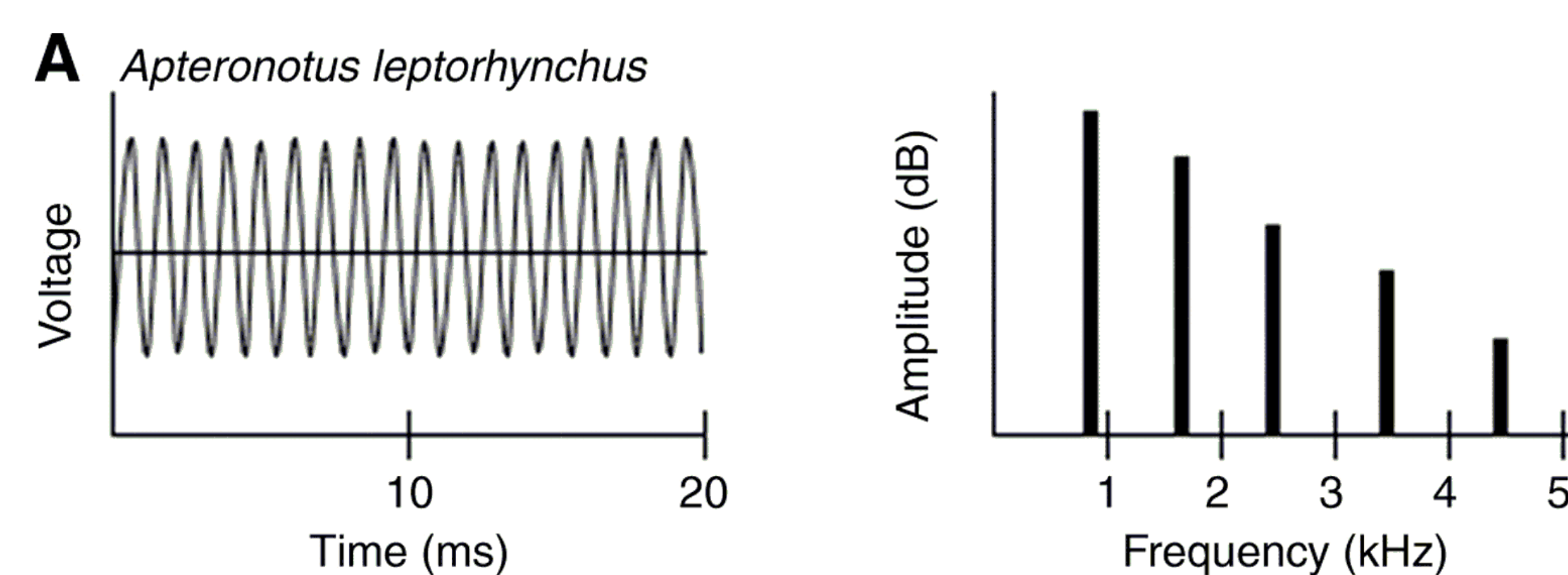
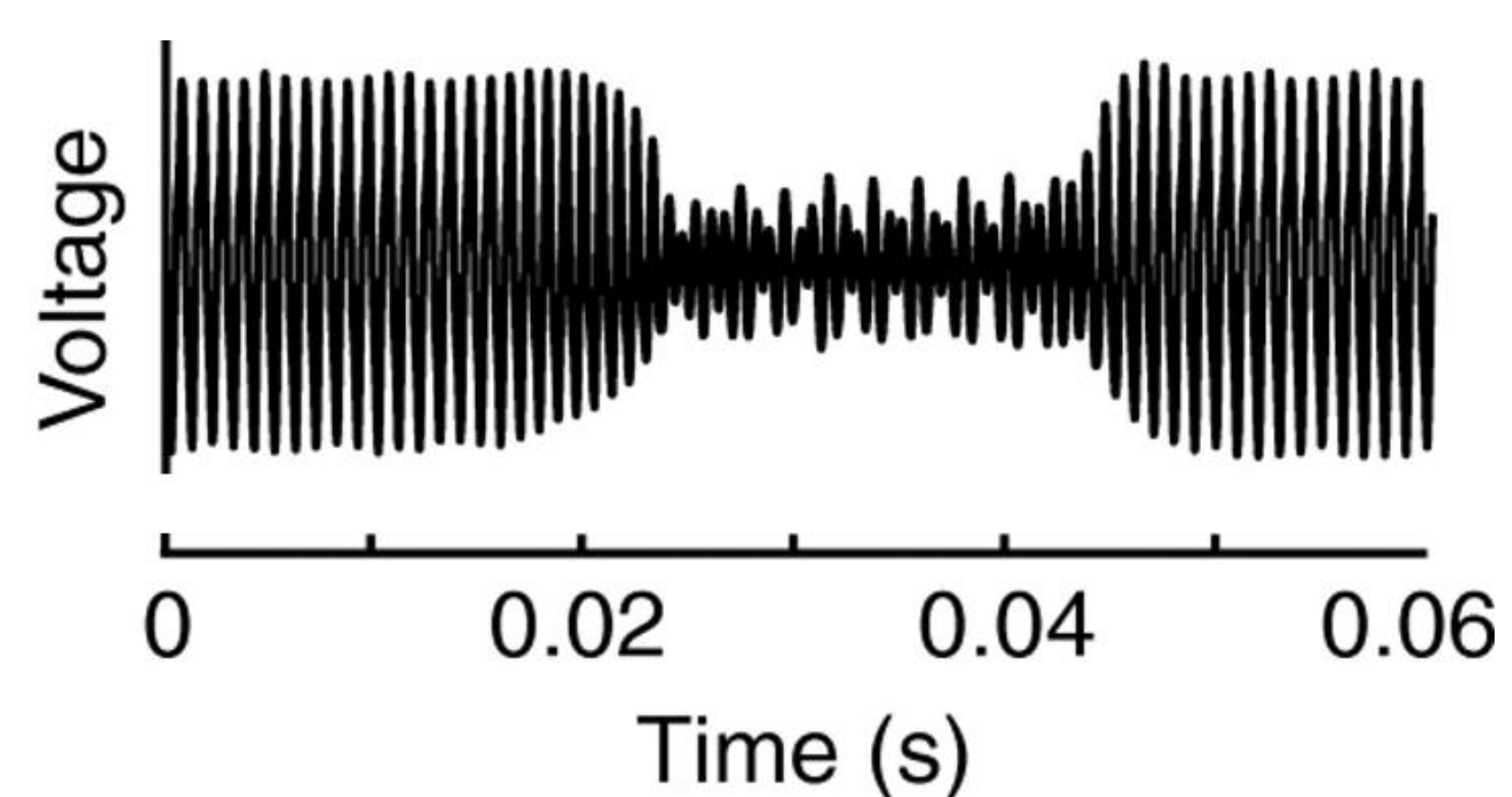
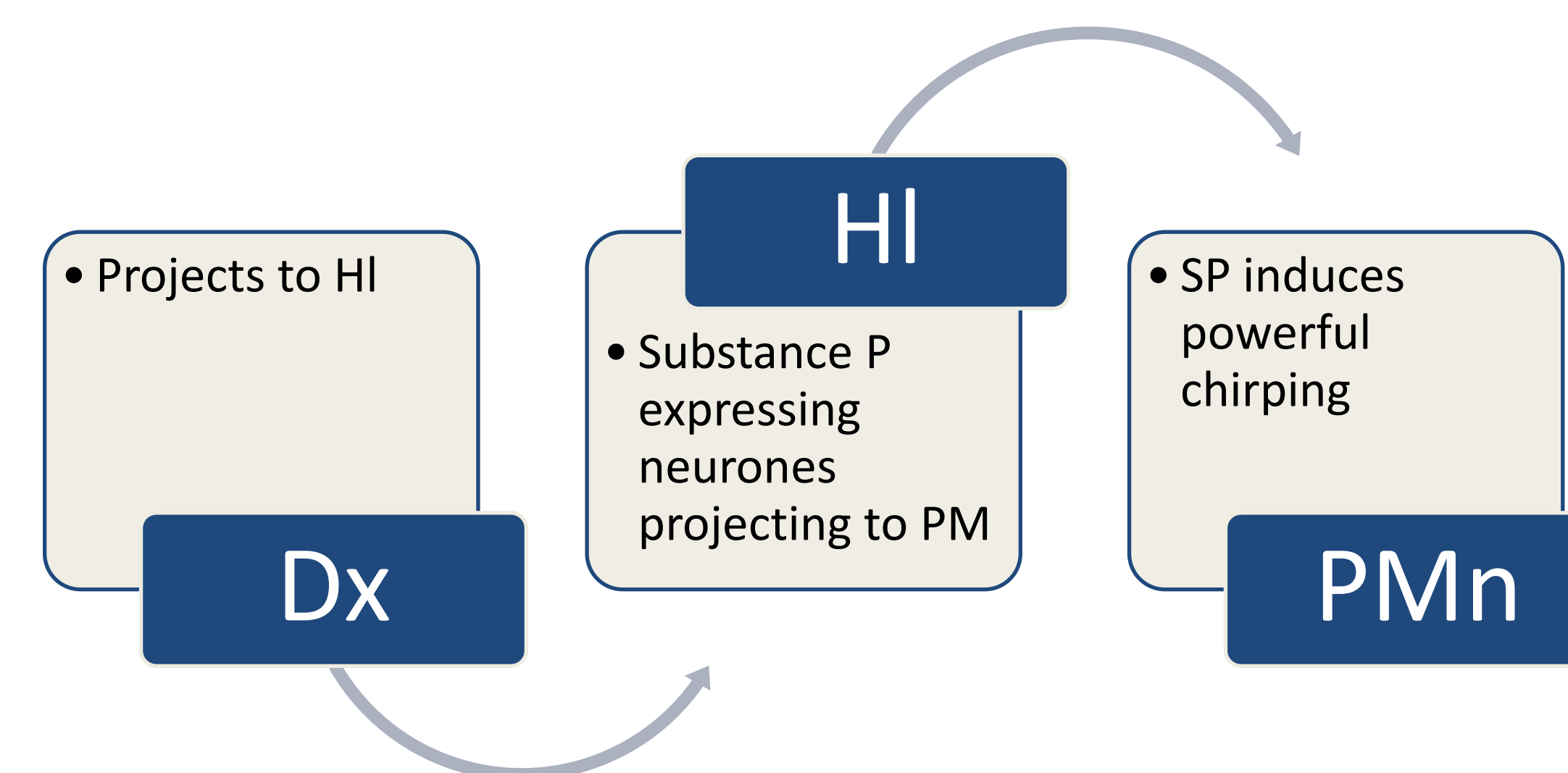


Figure 2. Schematic electric organ discharge waveform (left) and spectrum (right) in *Apteronotus leptorhynchus*



Hypothesis

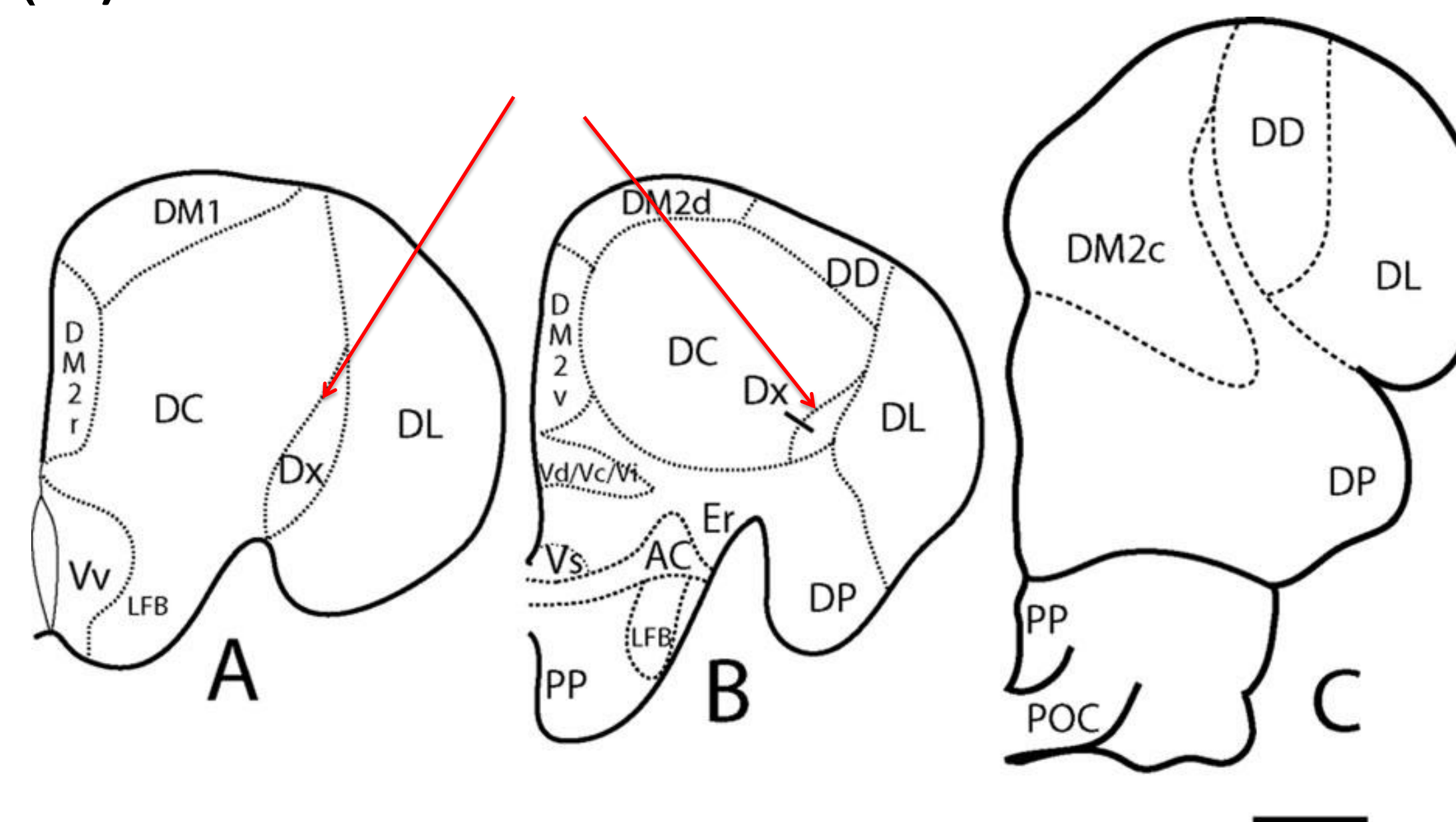
- In *Apteronotus leptorhynchus*, release of Substance P has been shown to cause chirps.
- Dorsal telencephalon division “x” projects to HI
- HI contains Substance P expressing neurones projecting to PM
- Therefore, we began by stimulating the forebrain in the Dx region



Methods

- Male fish capable of voluntary chirping were selected
- Selected fish were anaesthetized and forebrain was exposed
- Fish were paralyzed with Curare
- Fish were placed in stimulation tank and artificially respirated
- EOD was recorded
- Regions around Dx were stimulated by a train of 20- μ A pulses at 20-ms interpulse intervals with a Wood’s metal electrode
- Changes in EOD frequency and amplitude were recorded

Figure 3. Schematic drawings of transverse sections through the telencephalon, including dorsal telencephalon division “x” (Dx)



Conclusions

- Not results have yet been obtained as the project is quite large and time consuming
- Looking ahead, identifying the region of the forebrain responsible for chirps would allow for characterization of the mechanism involved
- Understanding how and why chirps are produced without stimulation will allow researchers to produce more accurate results in future experiments

References

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Contact Information

For more information you can contact Alexandre Pratt at:
Email: aprat101@uottawa.ca
Phone: (613)-794-6692

