

## 1. Introduction

Akuzipik is an Indigenous Yupik language spoken by ≈540 speakers on St. Lawrence Island, Alaska [1, 2]

**Table 1.** Previous description of Akuzipik fricatives; top: Latin orthography, bottom: IPA. (adapted from [3])

	Labial		Apical		Velar		Labialized Velar		Laryngeal
	Dental	Retroflex	Palatal	Front	Back	Front	Back		
Voiced Fricatives	v	l	r	z	y	g	gh	w	ghw
Voiceless Fricatives	f	ll	rr	s		gg	ghh	wh	ghhw
	f	ɬ	ʂ	s		x	χ	x <sup>w</sup>	h

### Research goal

Investigate the acoustic properties of Akuzipik dorsal fricatives by looking at spectral moments and duration by place of articulation and position within word

## 2. Materials and methods

### Participants

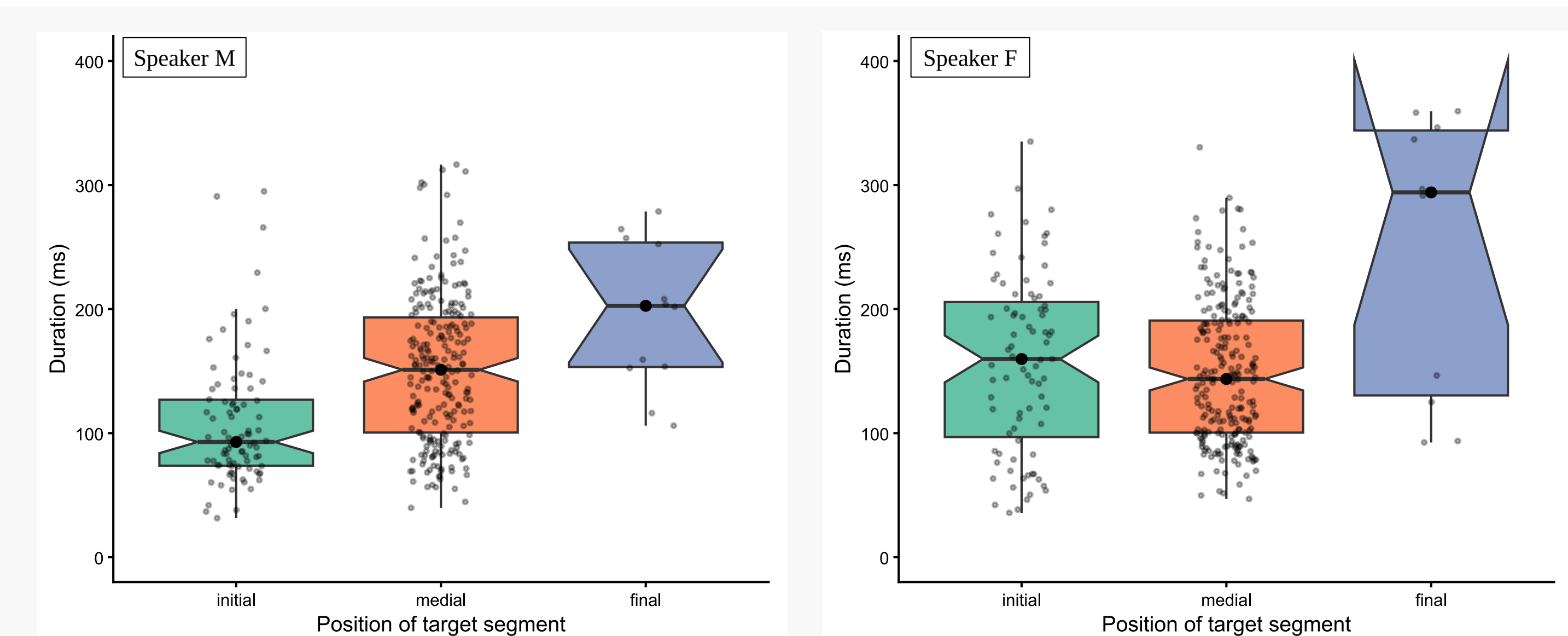
- Two native speakers: M (≈45y), F (≈40y)

### Stimuli

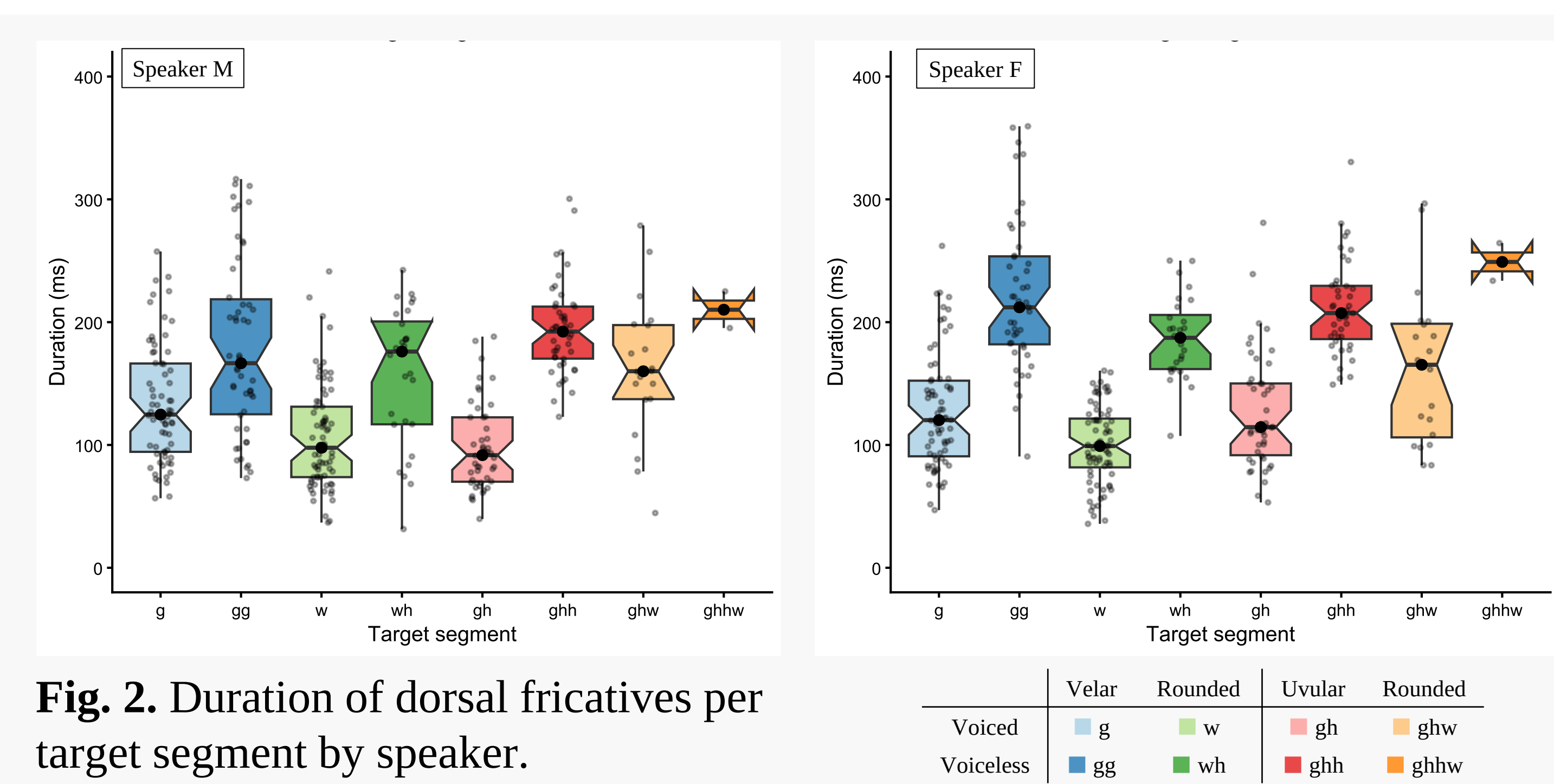
- Multi-purpose data collection: words/sentences selected from the Akuzipik dictionary [4]
- 672 observations (168 items, 2 reps per speaker)
  - Position: #CV, VCV, VC#
  - Segment: ⟨g gg w wh gh ghh ghw ghhw⟩

### Methods

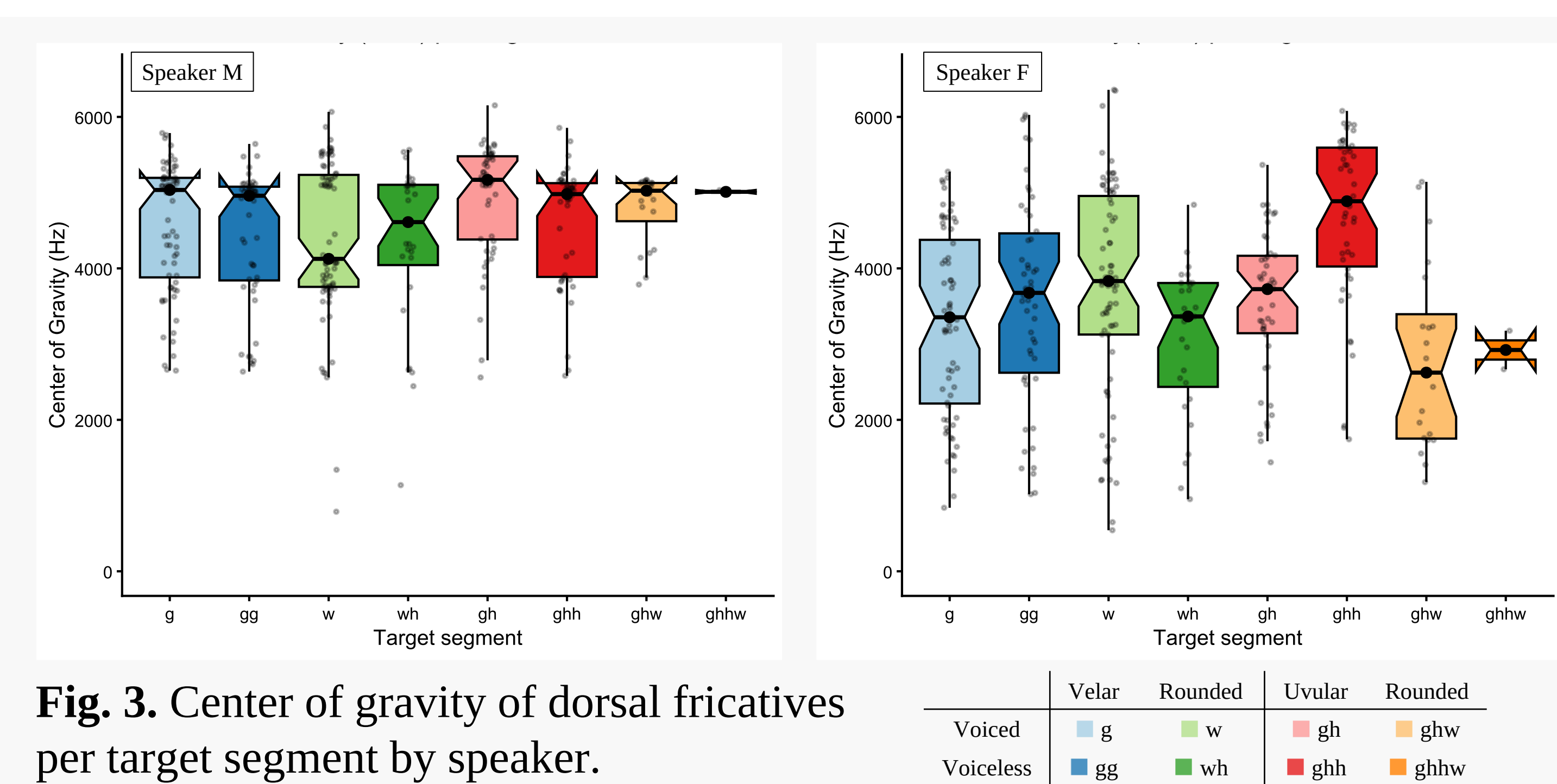
- Audio data collected on St. Lawrence Island, AK using a Zoom H4e handheld recorder
- Environment and fricatives manually annotated; duration and spectral moments (CoG, SD, peak) extracted via script [5]
- Linear mixed-effects models for duration and spectral moments
  - Fixed effects: position, segment
- Post-hoc pairwise comparisons with emmeans



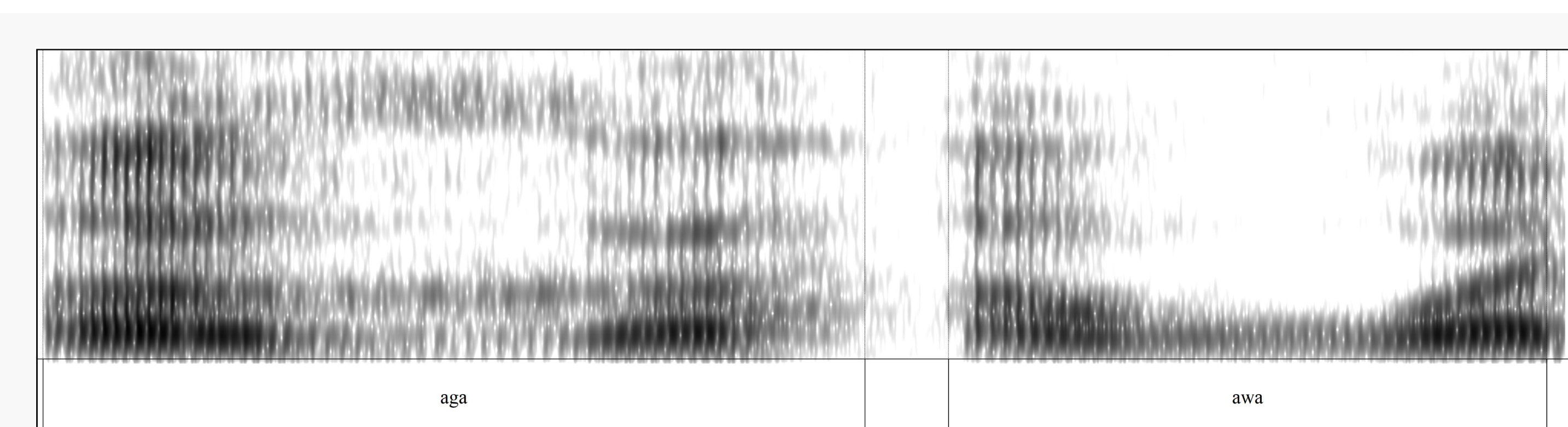
**Fig. 1.** Duration of target dorsal fricatives per position within word by speaker.



**Fig. 2.** Duration of dorsal fricatives per target segment by speaker.



**Fig. 3.** Center of gravity of dorsal fricatives per target segment by speaker.



**Fig. 4.** Spectrogram representations of speaker M's production of ⟨aga⟩ in *aga* (left) and ⟨awa⟩ in *awalmik* (right).

## 3. Results

### Duration

- Per position (Fig. 1): all significant, except medial-final for speaker M
- Per segment (Fig. 2): all significant within each pair except ⟨ghw ghhw⟩ for both speakers

### Center of gravity (CoG)

- Per position: not significant for either speaker
- Per segment (Fig. 3): not significant for speaker M
  - Speaker F: significant differences observed in the pairs ⟨g gh⟩, ⟨wh ghh⟩, ⟨ghh ghw⟩

## 4. Discussion & Conclusion

- ⟨w⟩ consistently realized as [w]
  - ⟨g⟩ sometimes also realized as [w], esp. in medial position (Fig. 4)
- High speaker variability observed
  - Hyperarticulation; sociophonetic variation
- Duration seems to be a strong acoustic correlate of voicing in velar and uvular fricatives
- Spectral moments did not consistently differentiate place of articulation among dorsal fricatives

### Future directions

- Investigate additional acoustic cues (environment, formant transitions, amplitude)
- Include more speakers and remaining fricatives

**Acknowledgements:** Igamsiqayugvikamsi, Sivuqaghmiini - thank you to the people of Sivuqaq/St. Lawrence Island. Many thanks to the members of the Mason Phonetics & Phonology Lab and the Language Documentation Lab for your feedback and continuous support; special thanks to Zach Nauluf for helping with the annotations. Portions of this work were funded by NSF DEL Grant #BCS 1760977.

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