Greers Ferry Tailwater Versus the World: a Meta-analysis and Comparison of Brown Trout Spawning

Doug Zentner, Steve Lochmann, and Jonathan Spurgeon

Brown Trout Around the World

- Spread to coldwater fisheries across the globe
- Heavily studied species (papers 1910-20s)
- Data can be used to predict spawning times and places

Brown Trout in Arkansas

- Introduced species within tailwaters
- Tailwaters less studied than natural streams and rivers
- Self sustaining in Greers Ferry Tailwater (GFTW)

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- Economically valuable fisheries in Arkansas

Objectives

The objectives of this study are to:

1) **Compare spawning times from the literature to GFTW**

2) **Establish generalized spawning suitability curves using literature data**

3) **Compare curves to measurements from GFTW**

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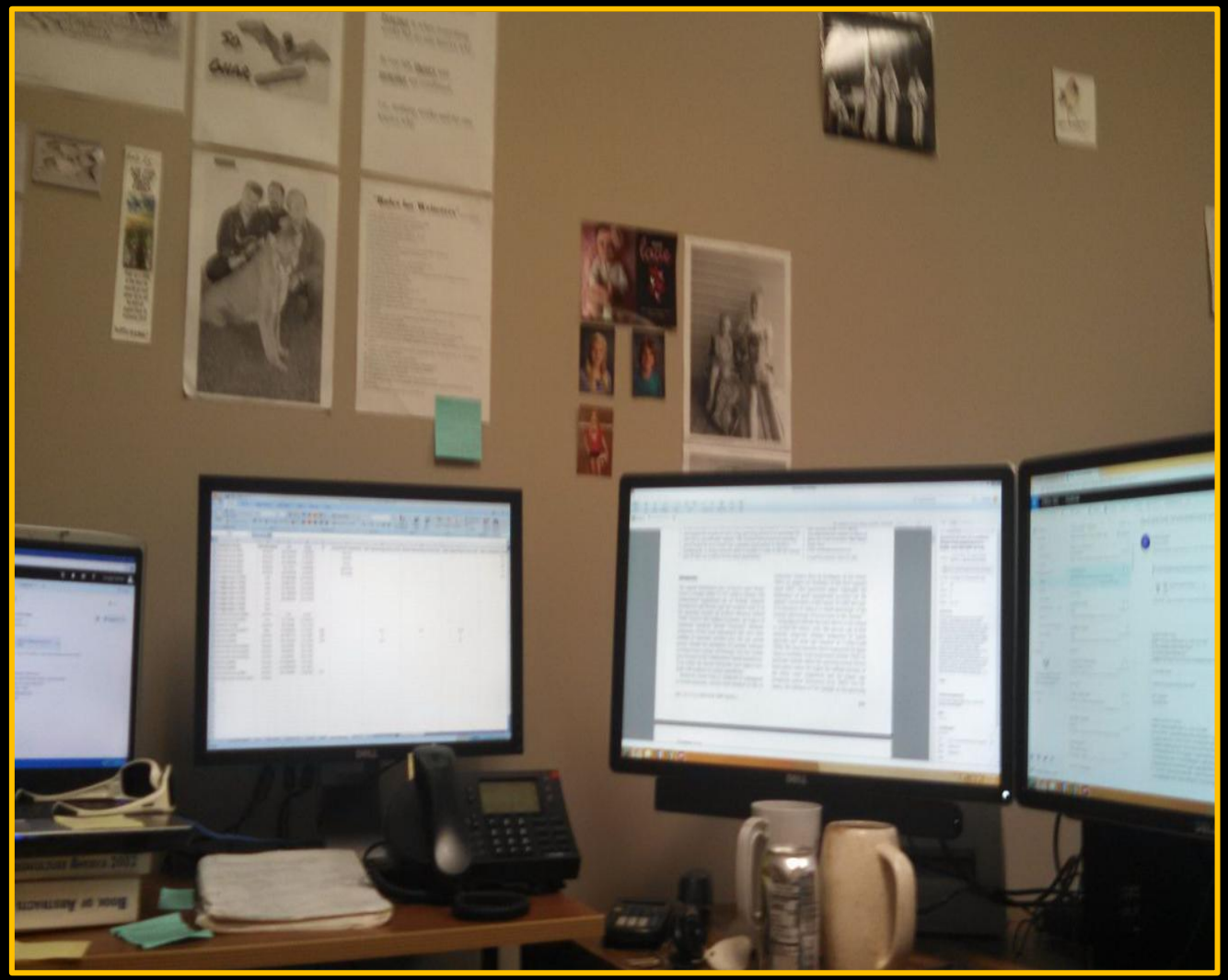
Spawning Times

- Lots and lots and lots and lots and lots of reading
- Compared times across the globe to times in Arkansas
- Looked at what the GFTW can add to this



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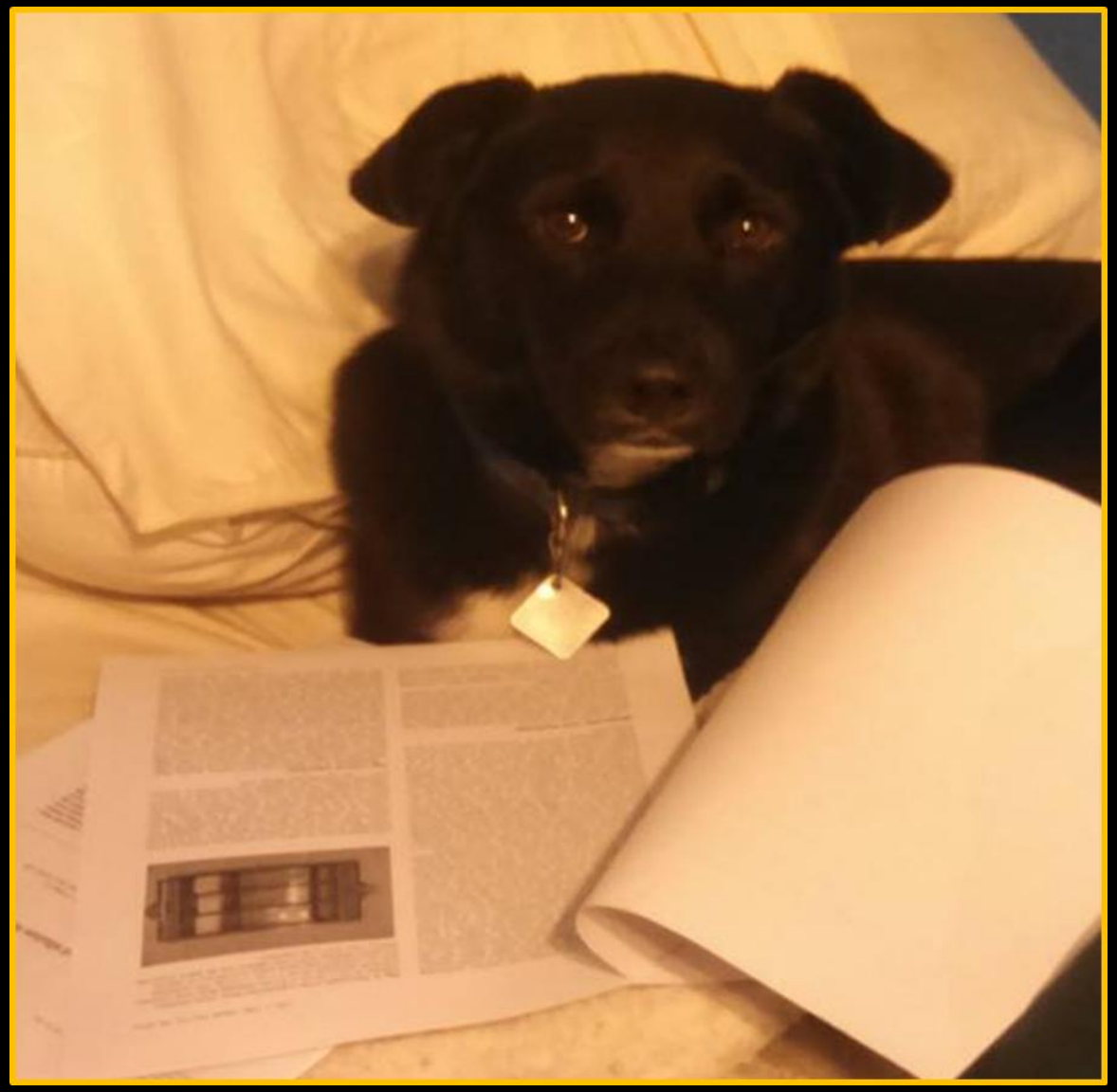

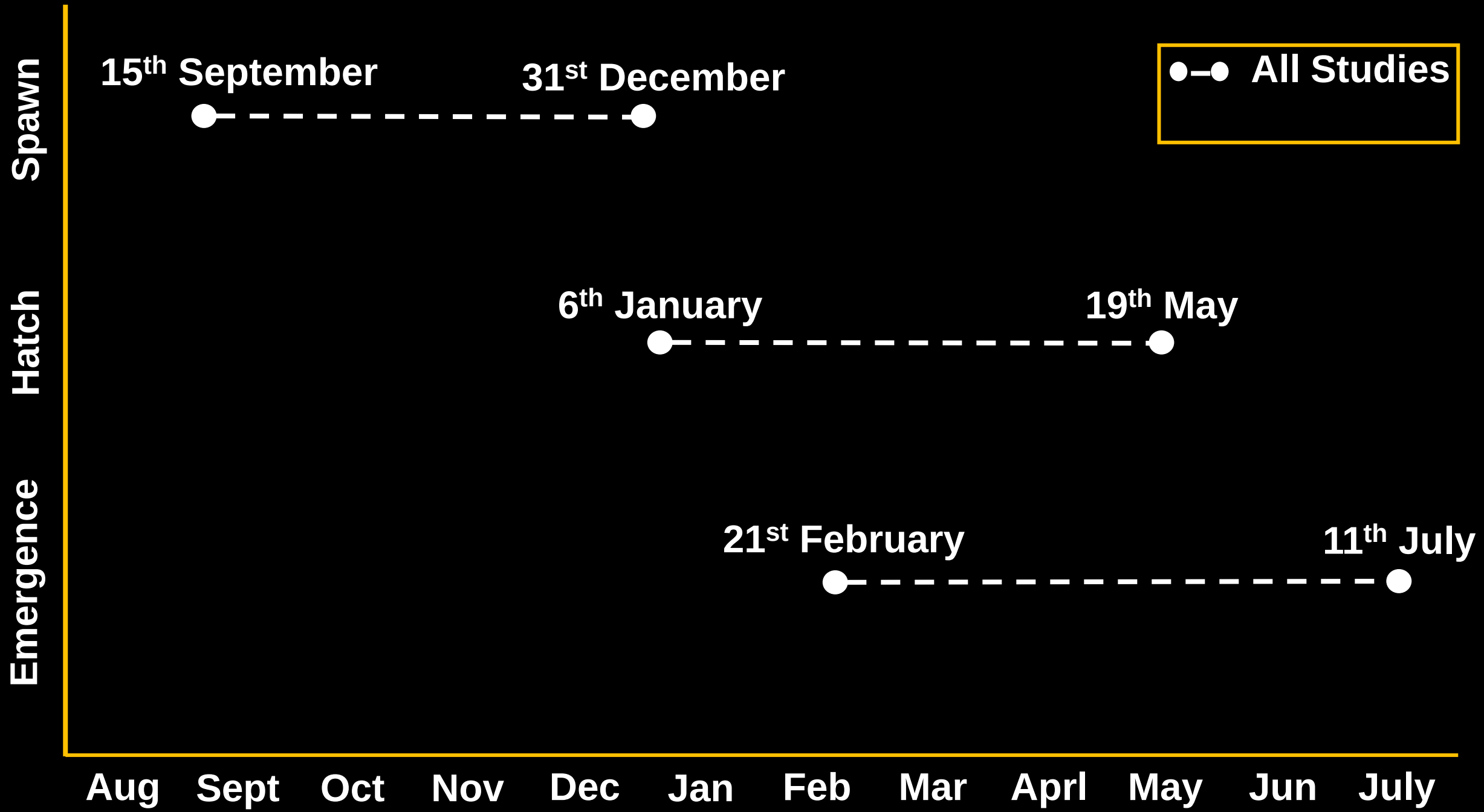
Spawn
Hatch
Emergence
15th September
31st December
6th January
19th May
21st February
11th July
All Studies
Aug
Sept
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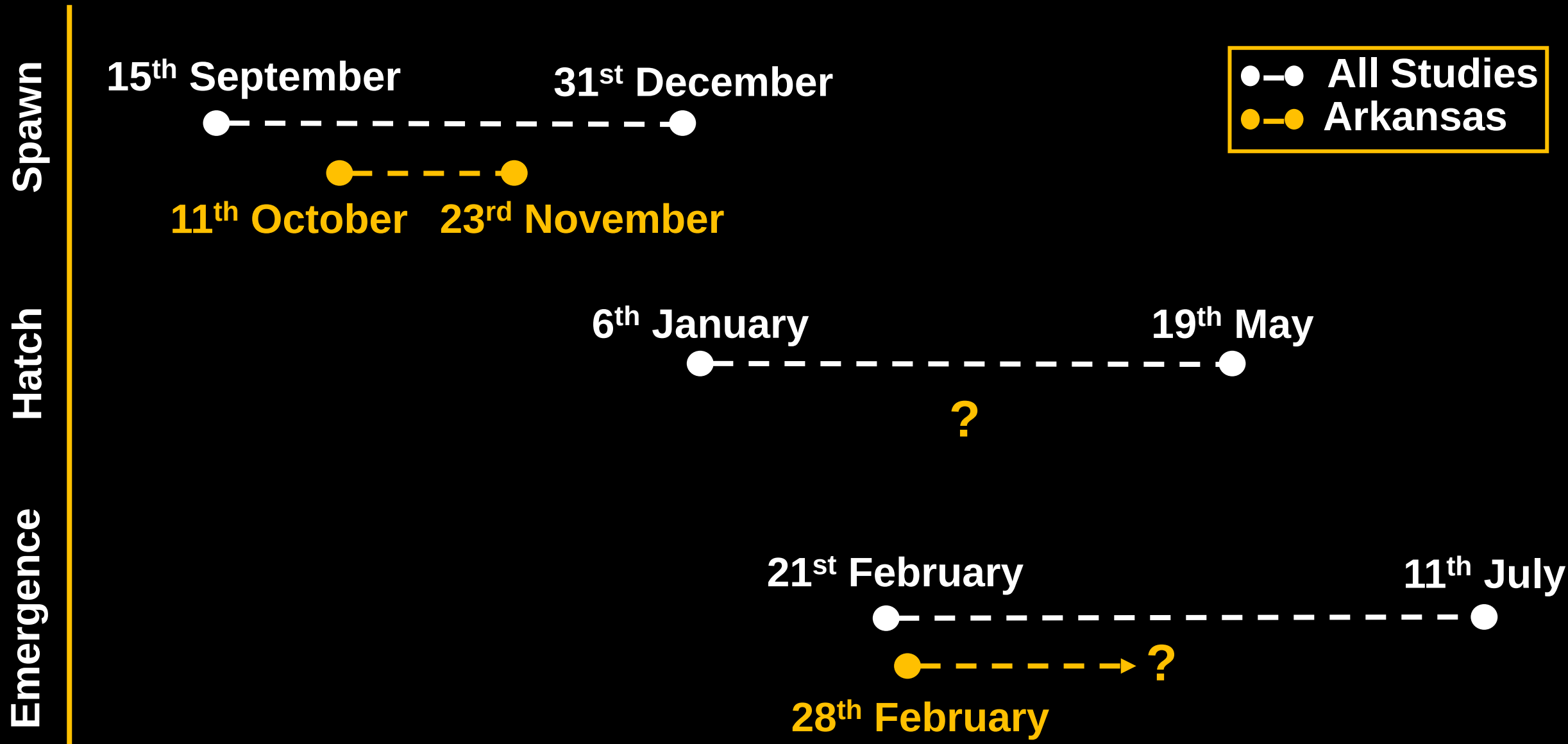
July


Spawn
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Emergence
15th September
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All Studies
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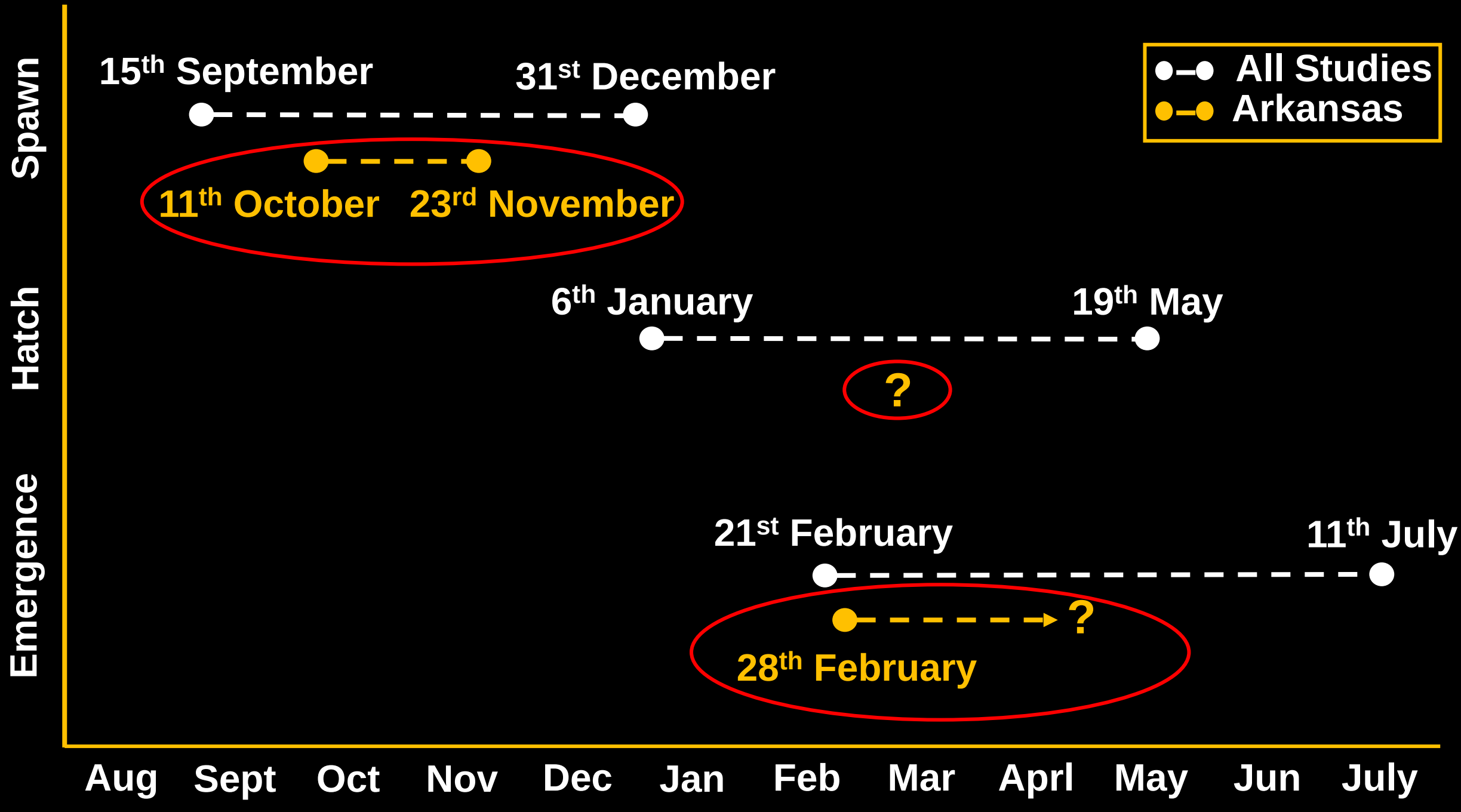
Spawn
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Arkansas
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28th February
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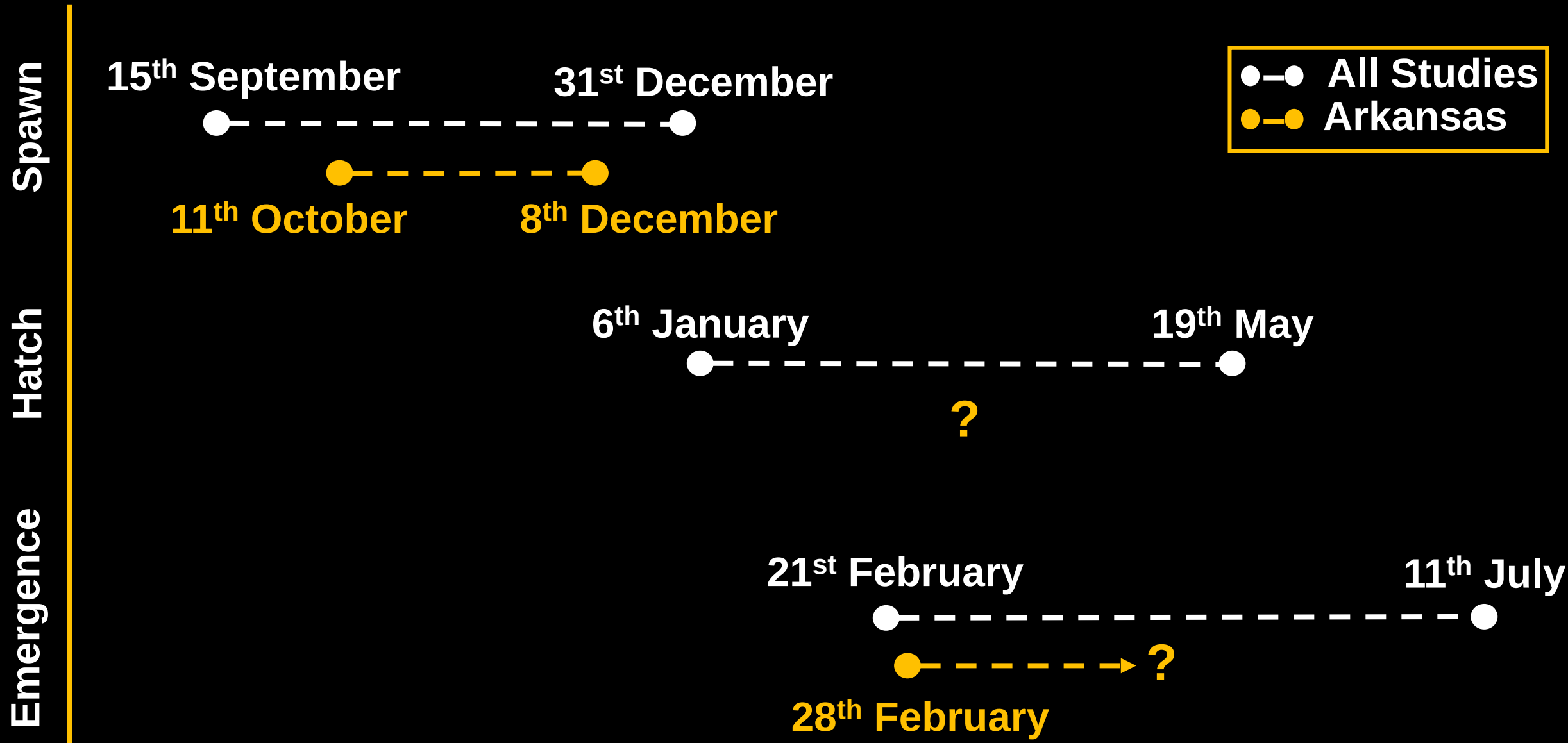
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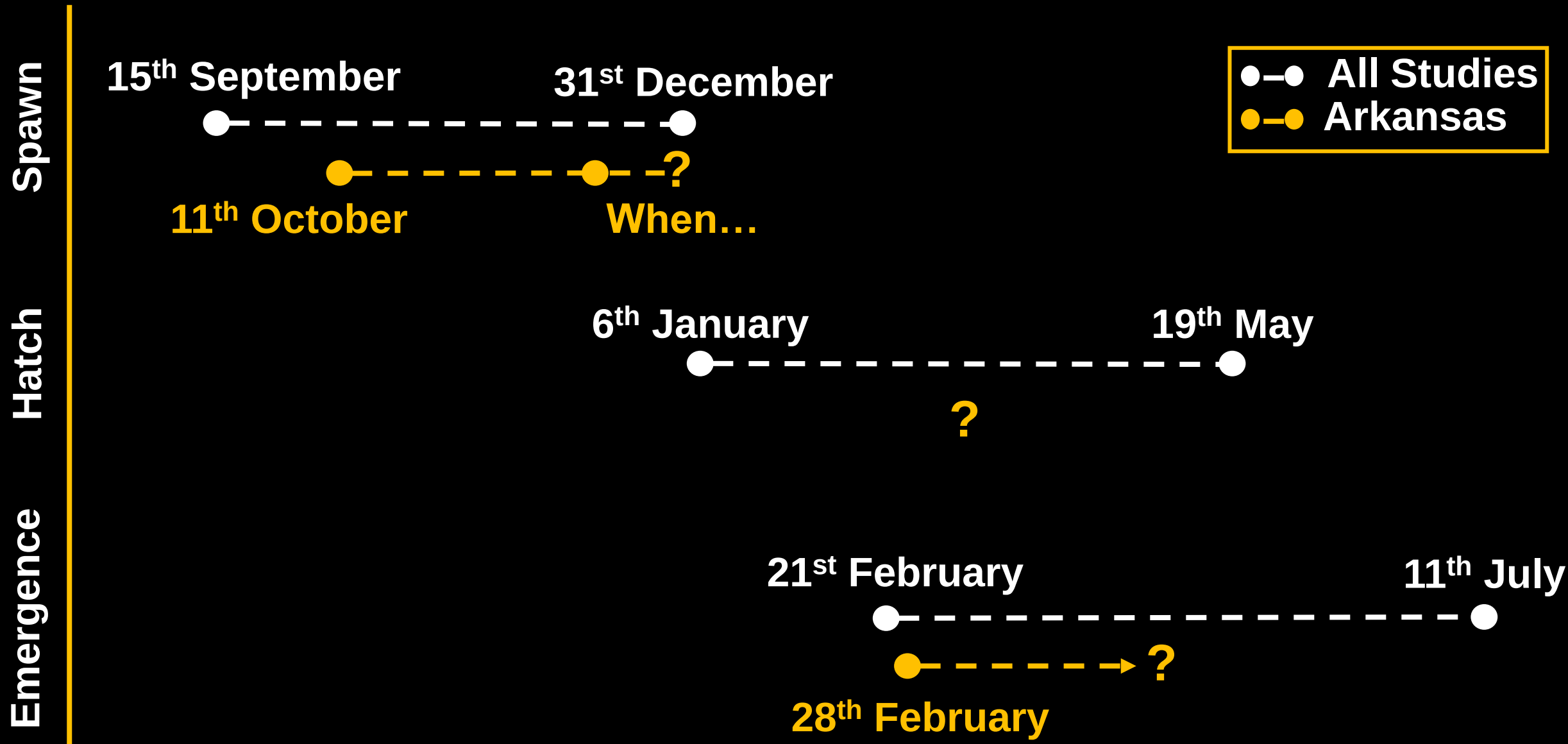
Spawn
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31st December
All Studies
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When…
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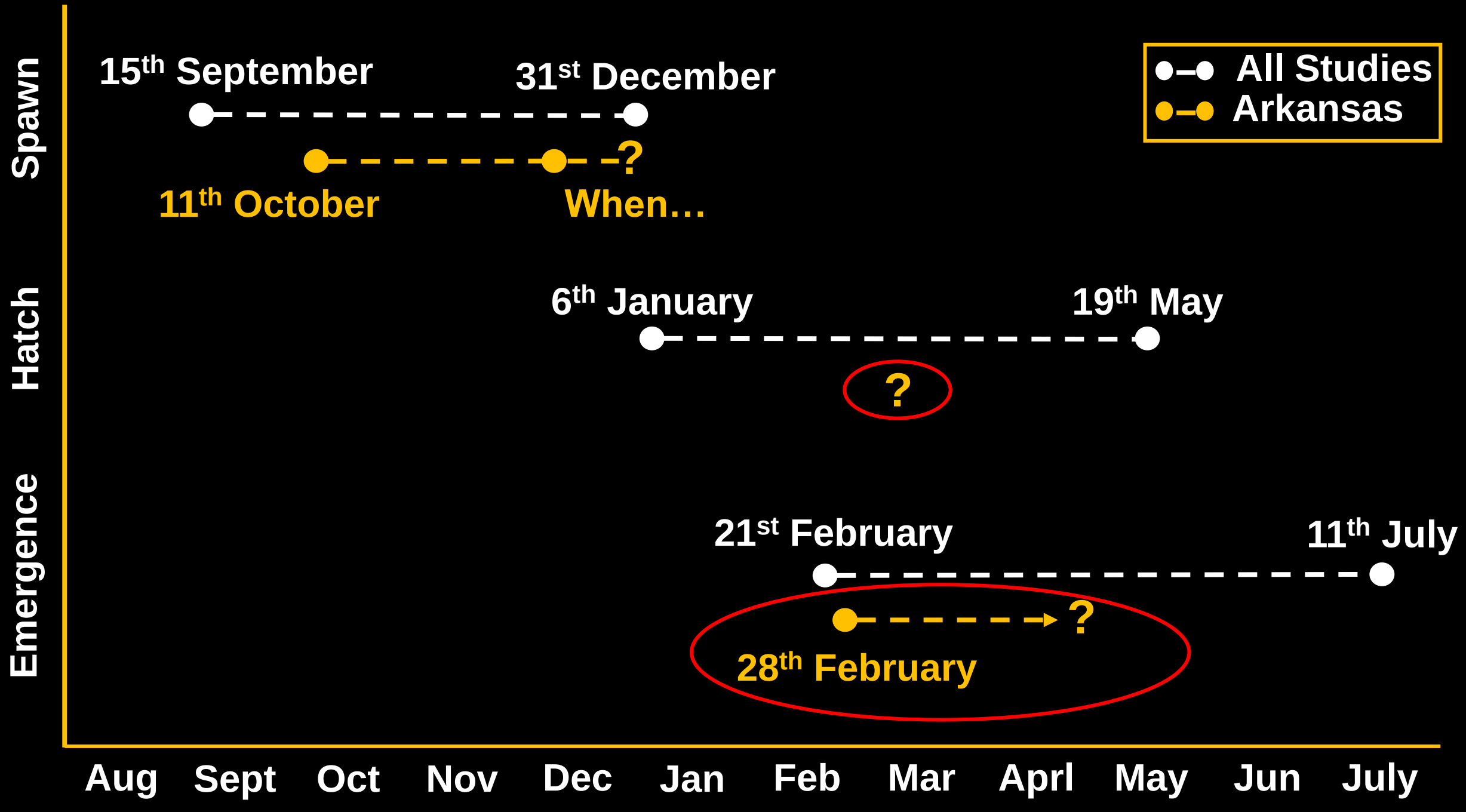
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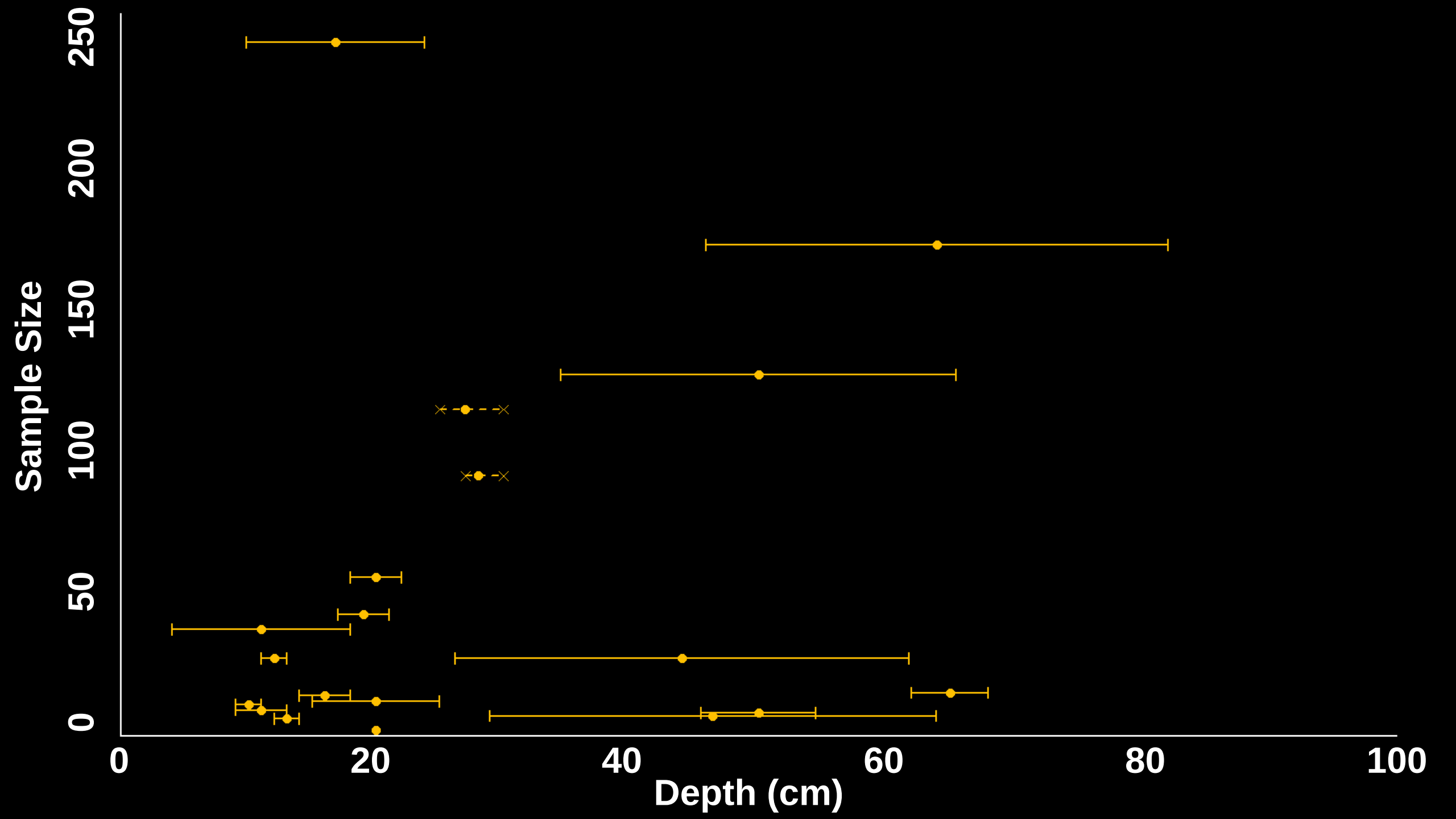
Suitability Curves and Comparison

- Literature on depth, water velocity, and substrate size
- Data then used to generate suitability curves
- Compared field data to suitability curves for each
- Generation variability and predicted suitability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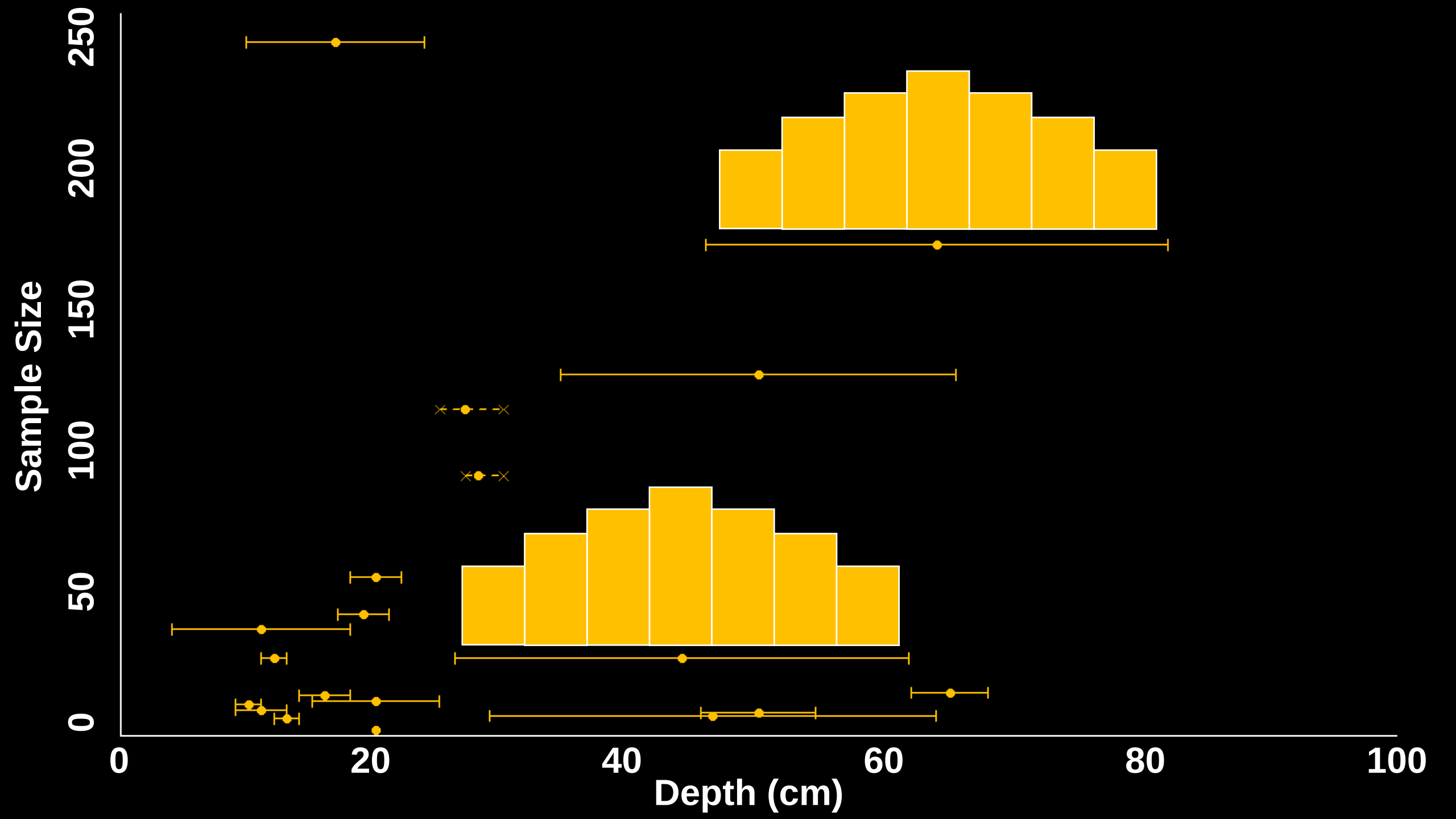
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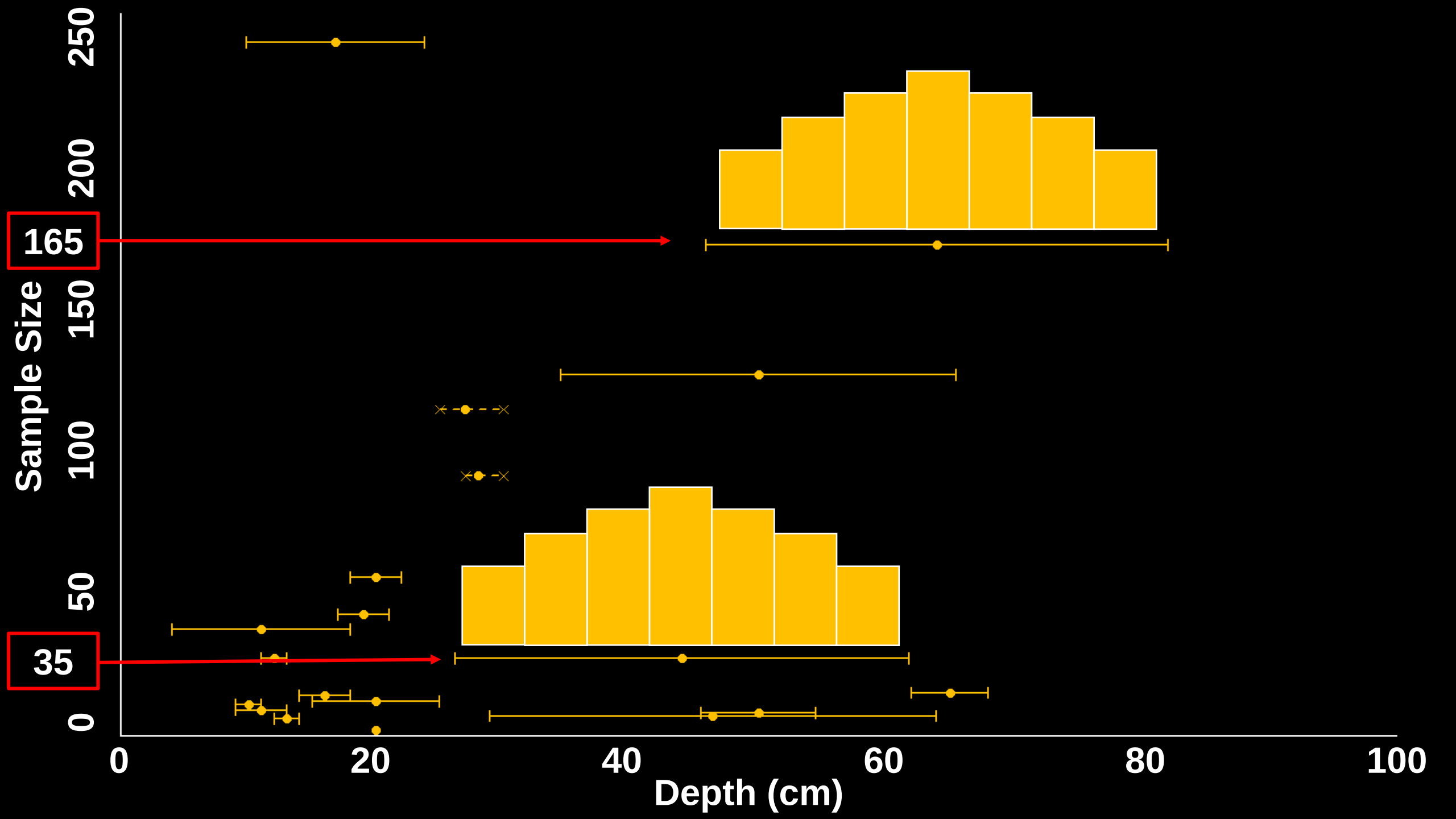
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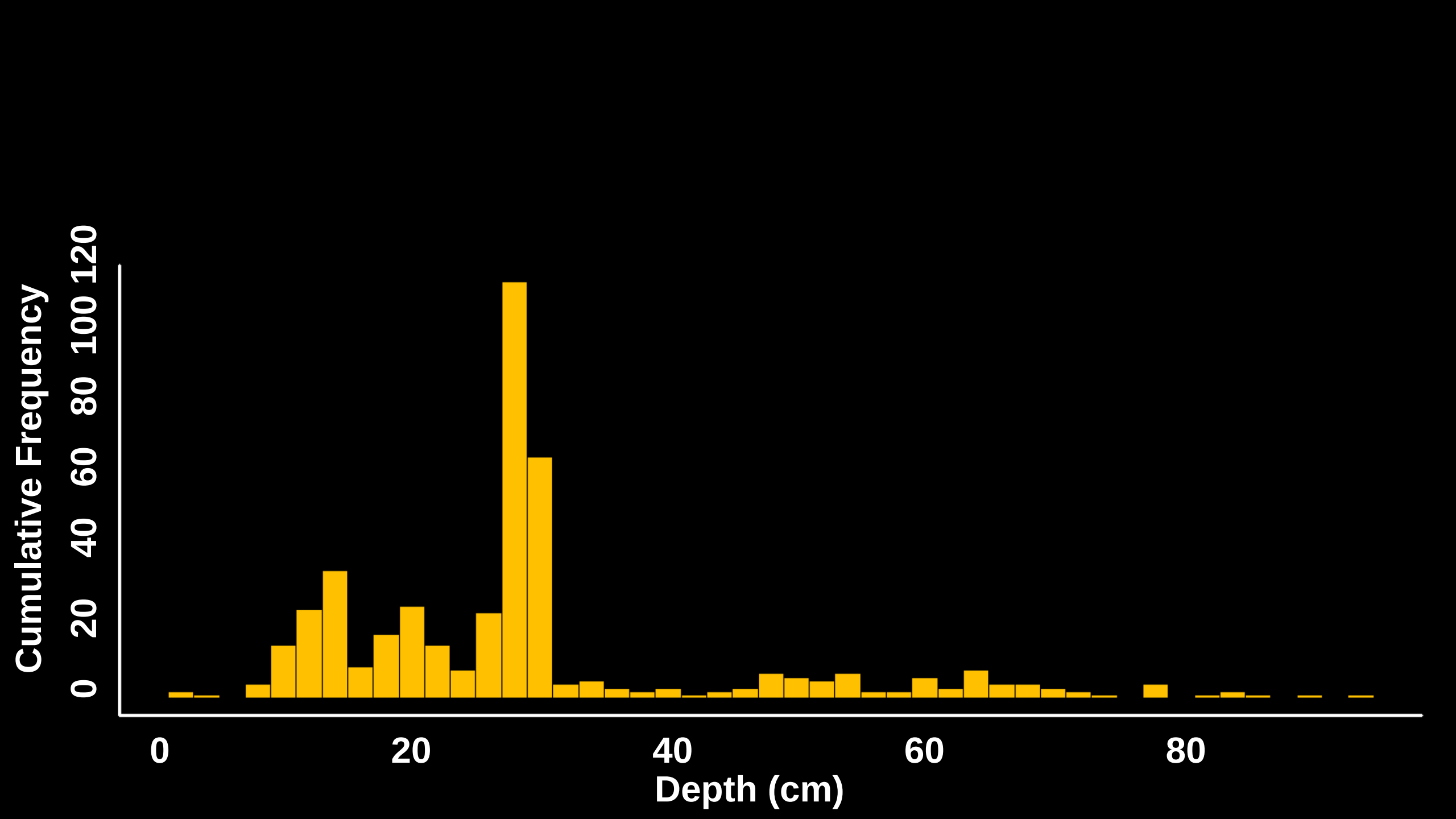
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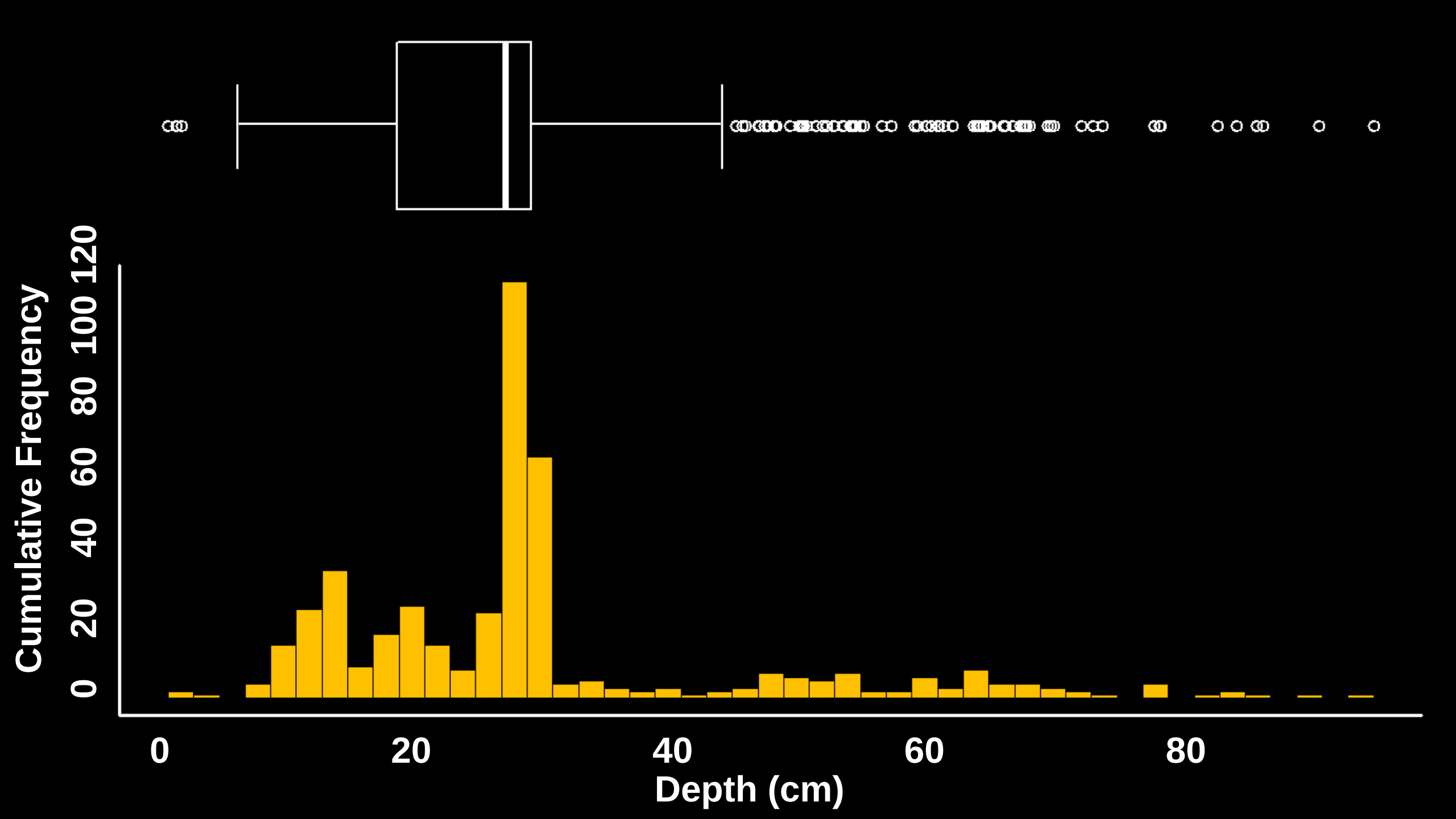
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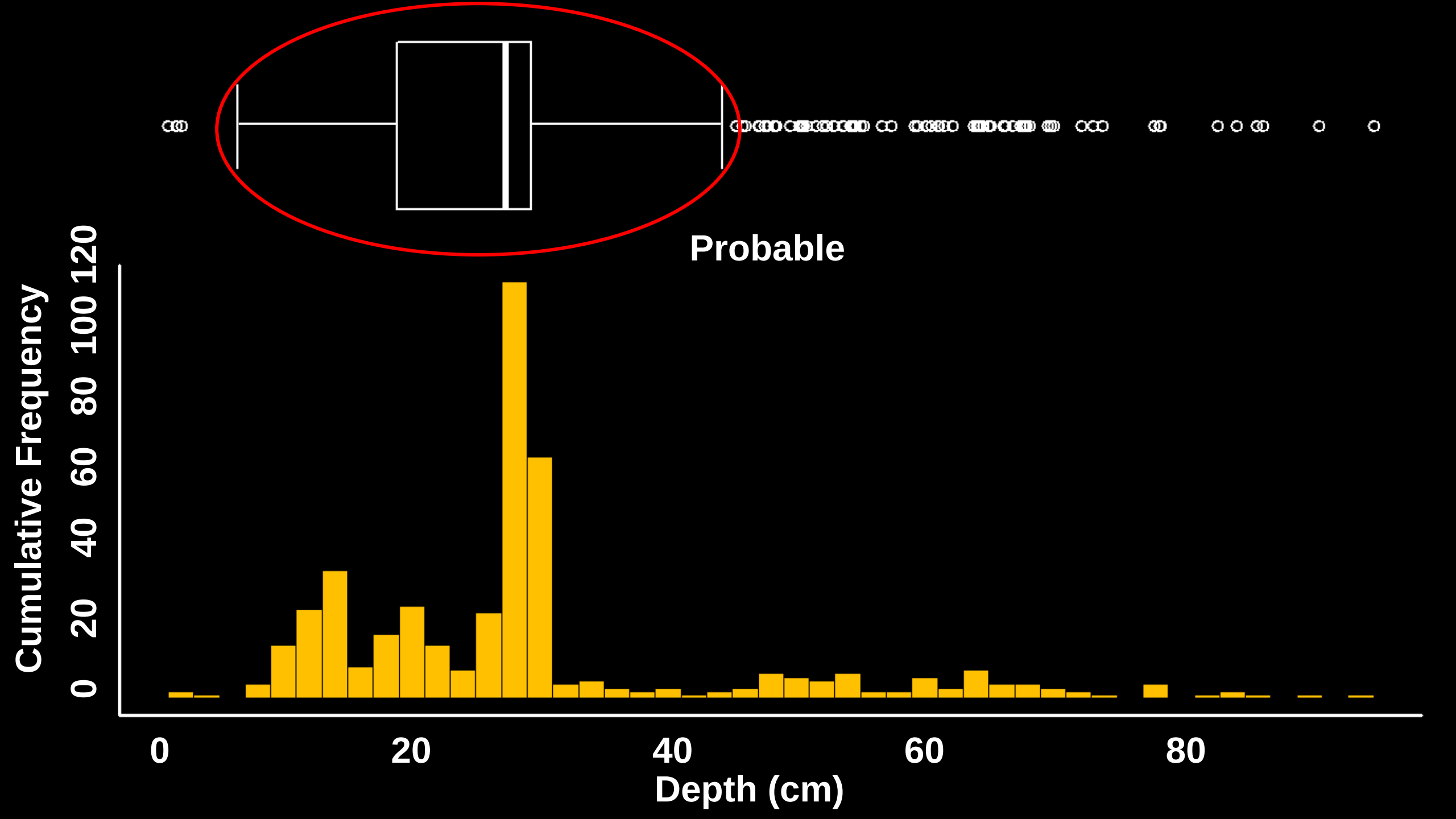
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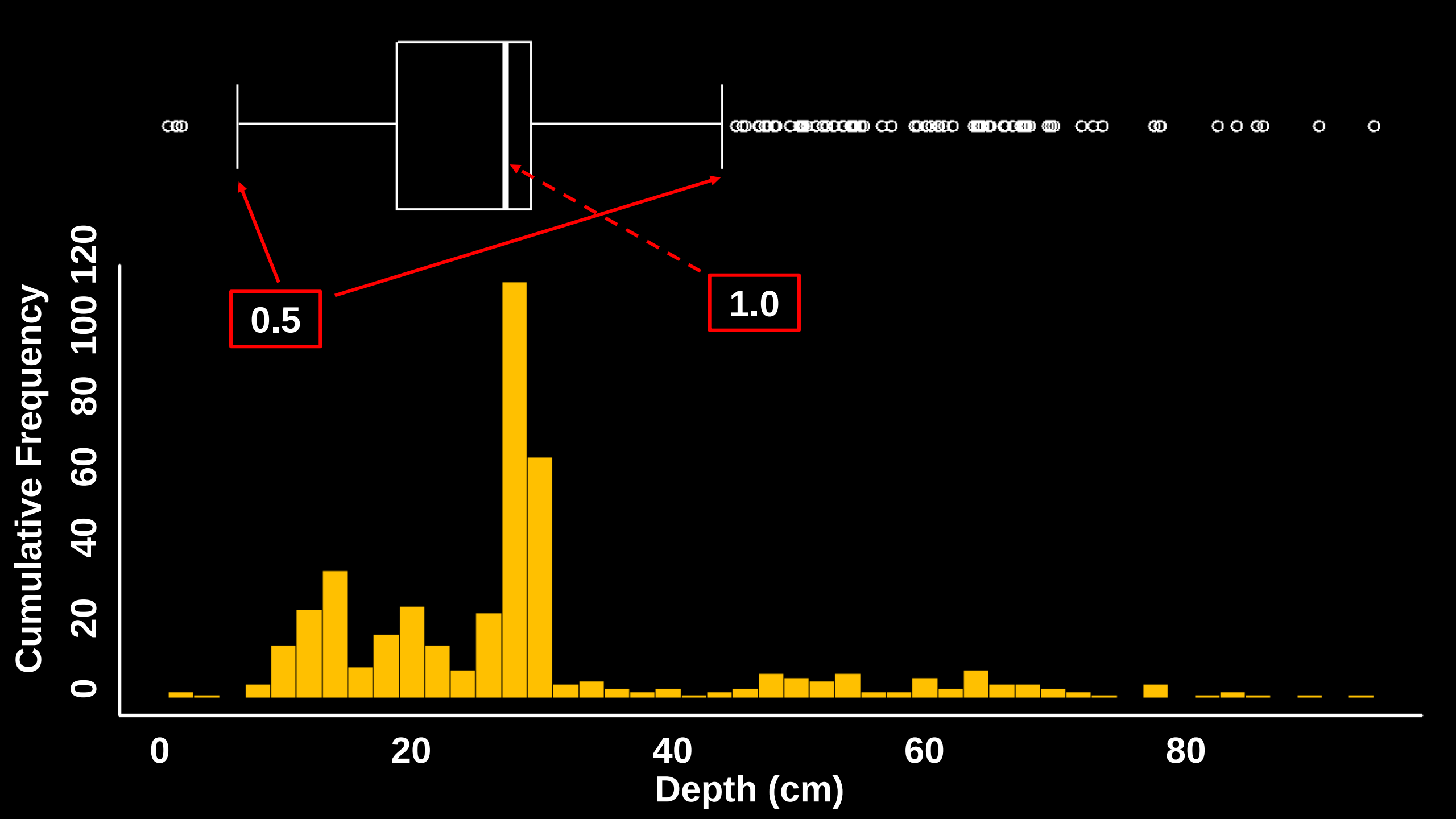
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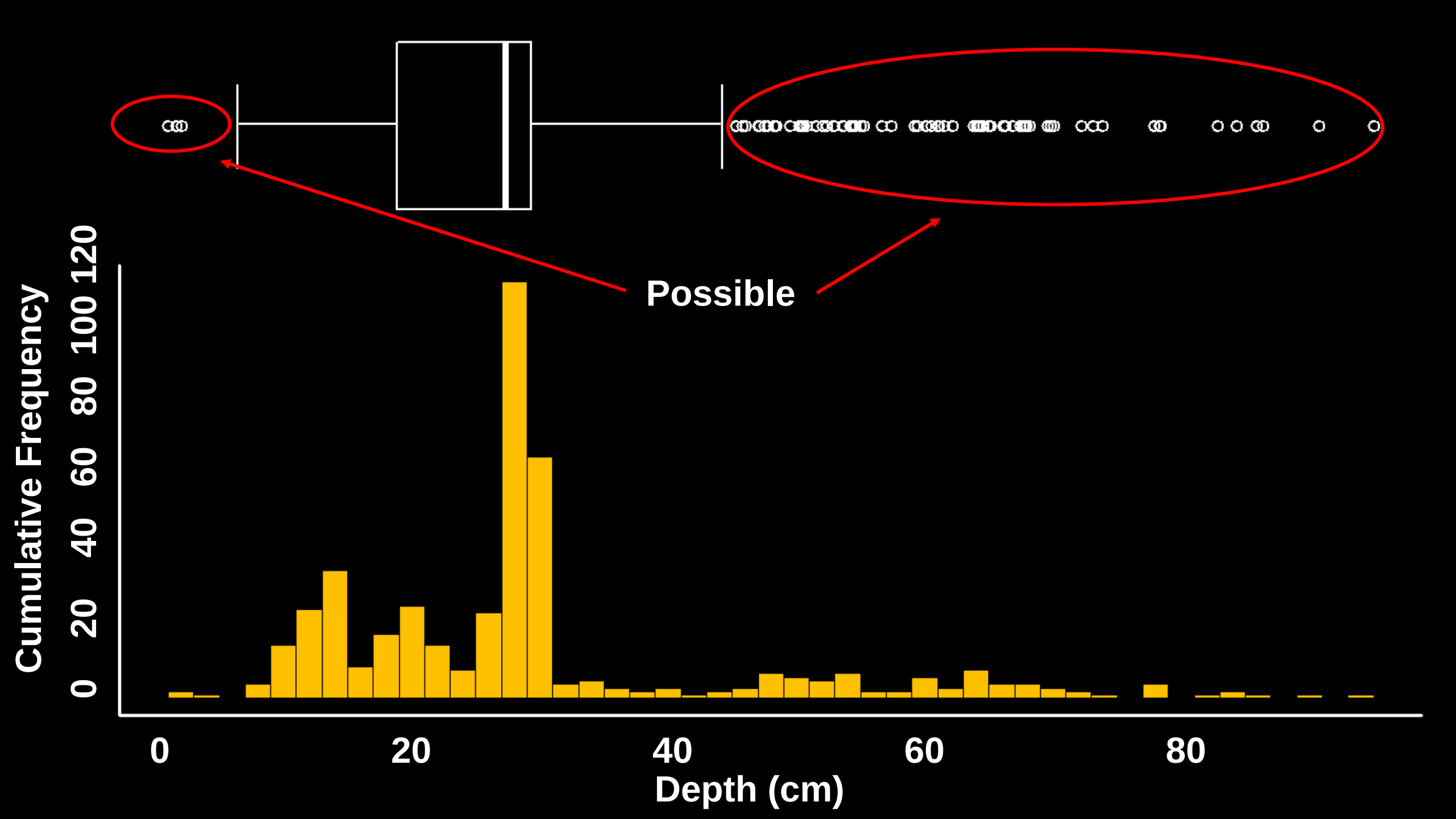
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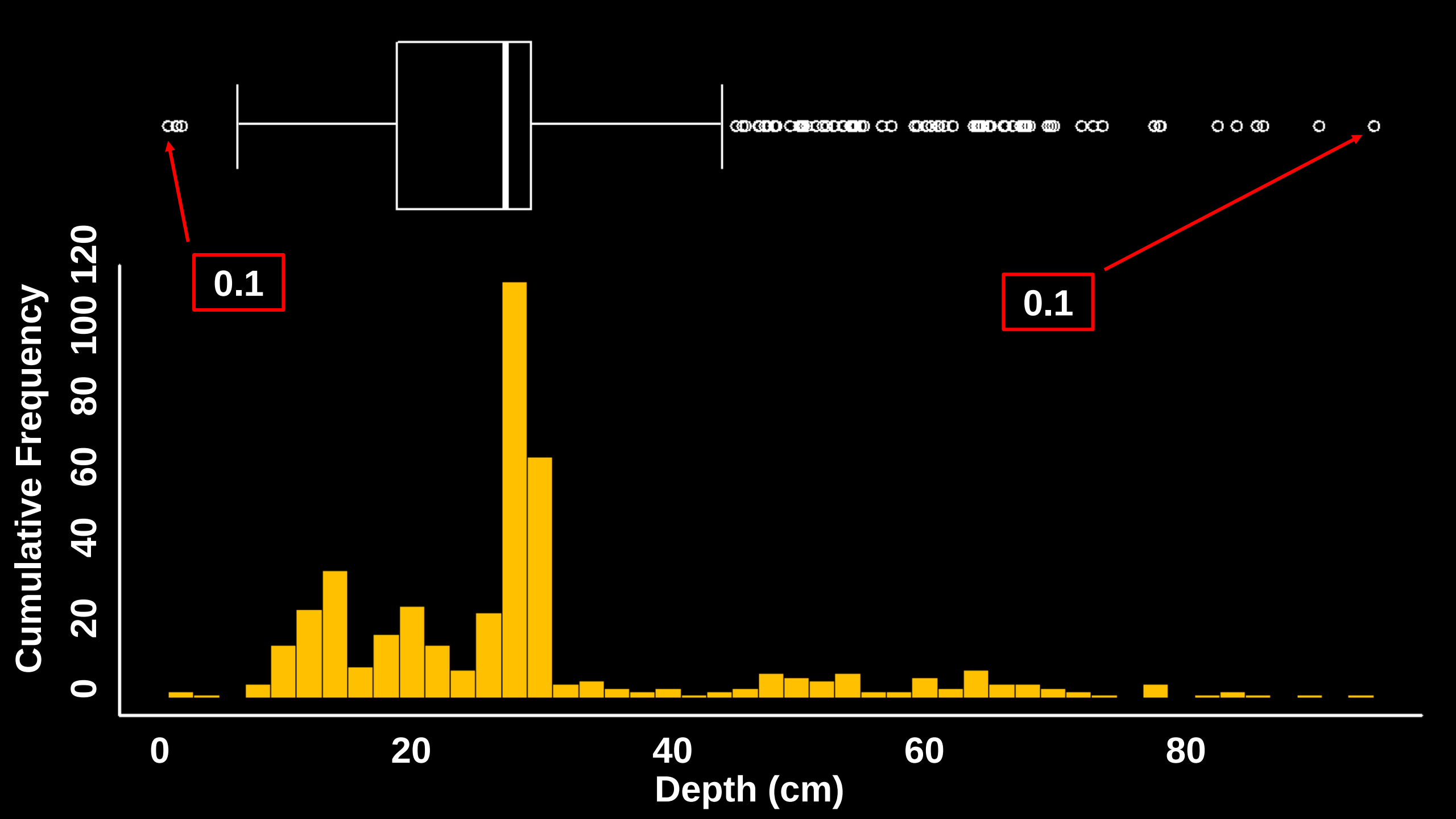
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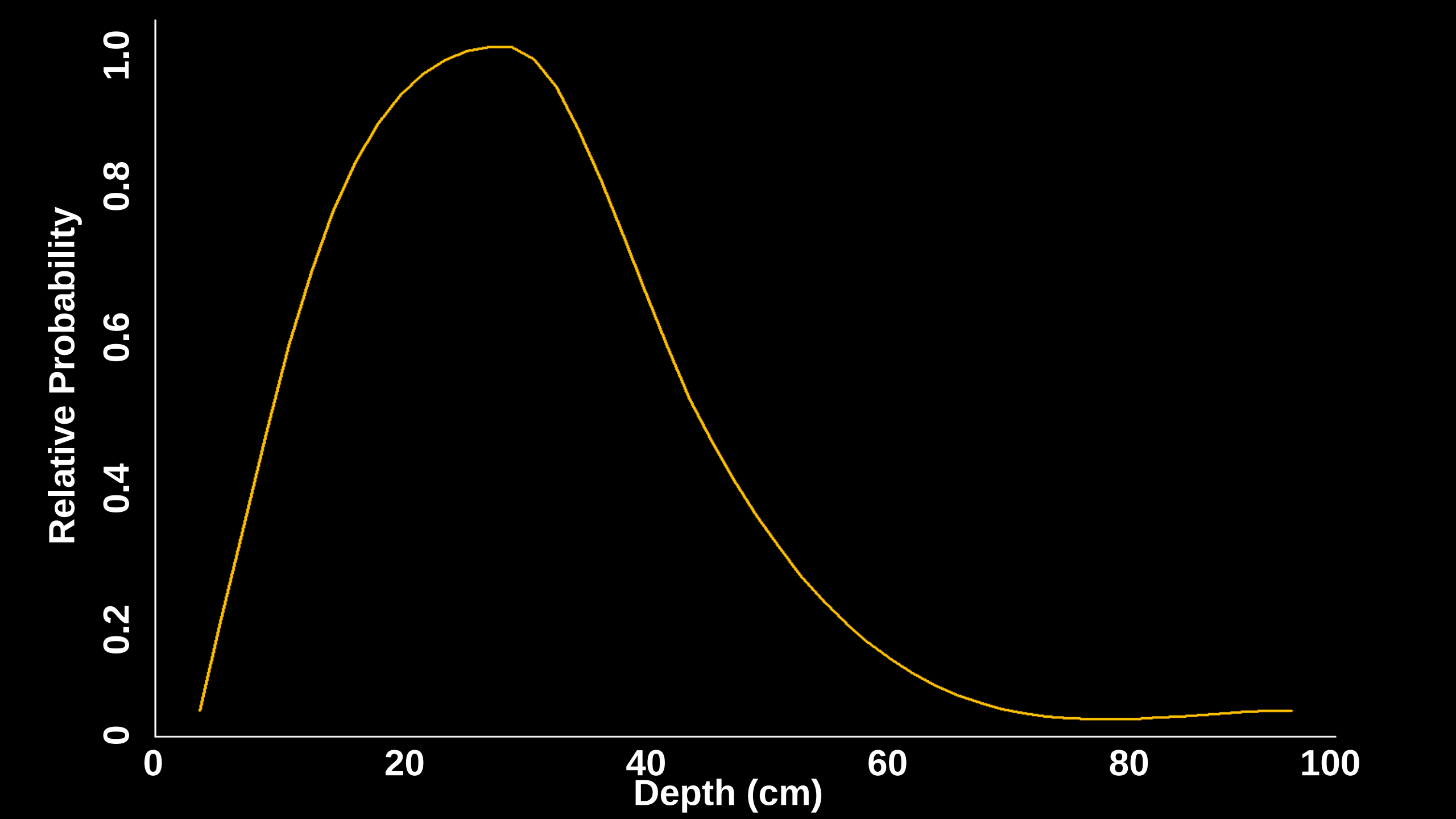
Depth (cm)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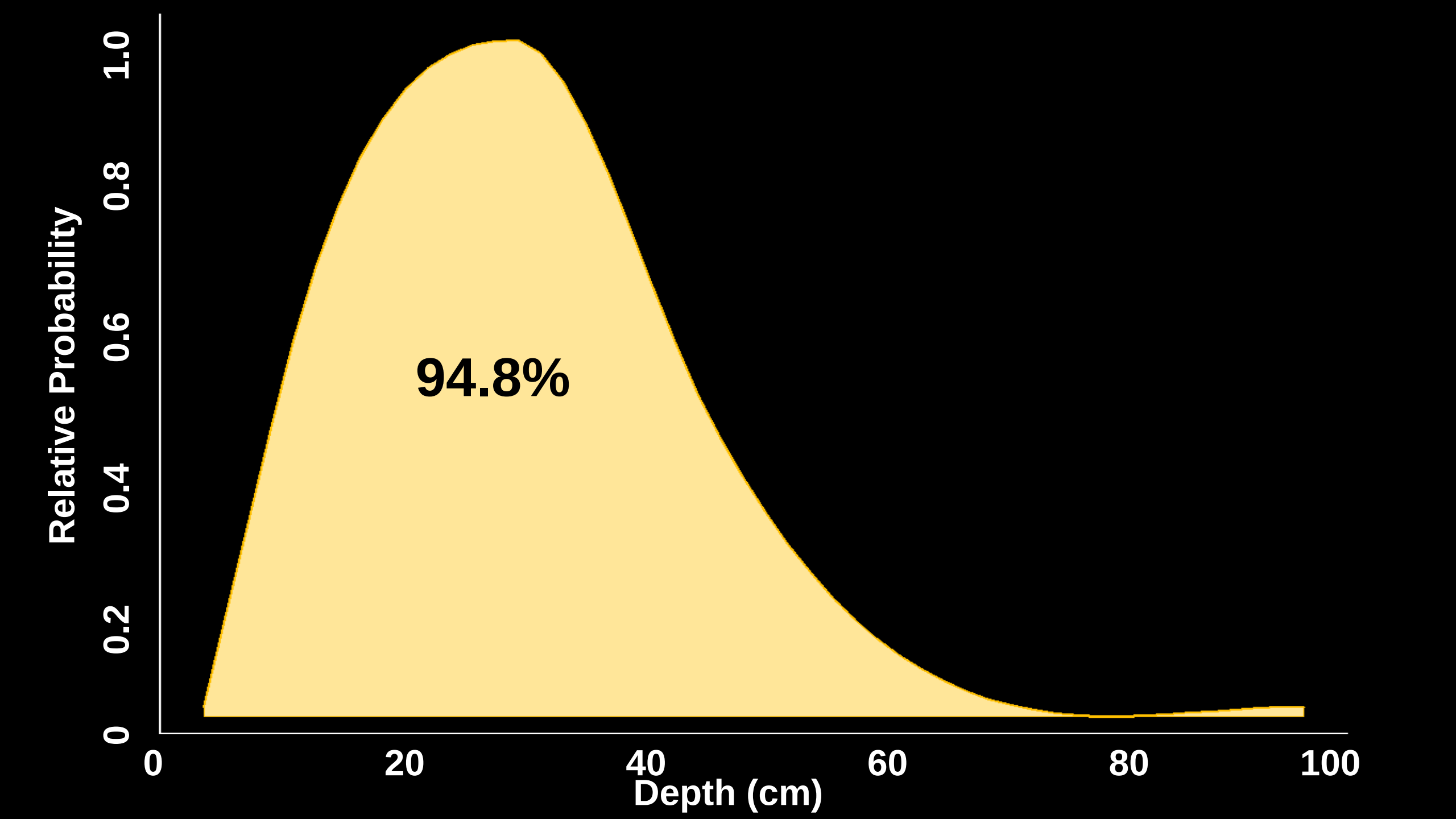
Depth (cm)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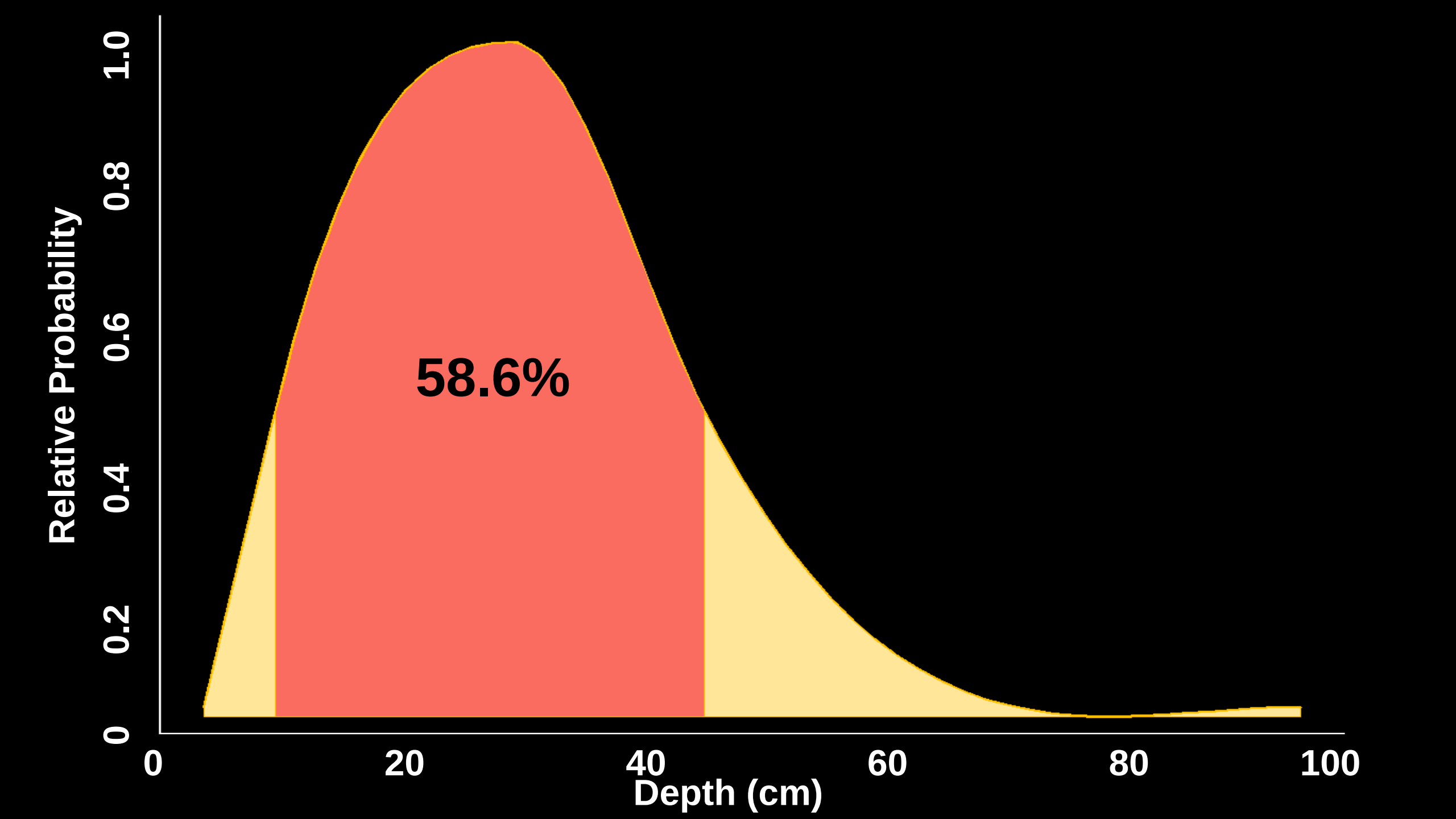
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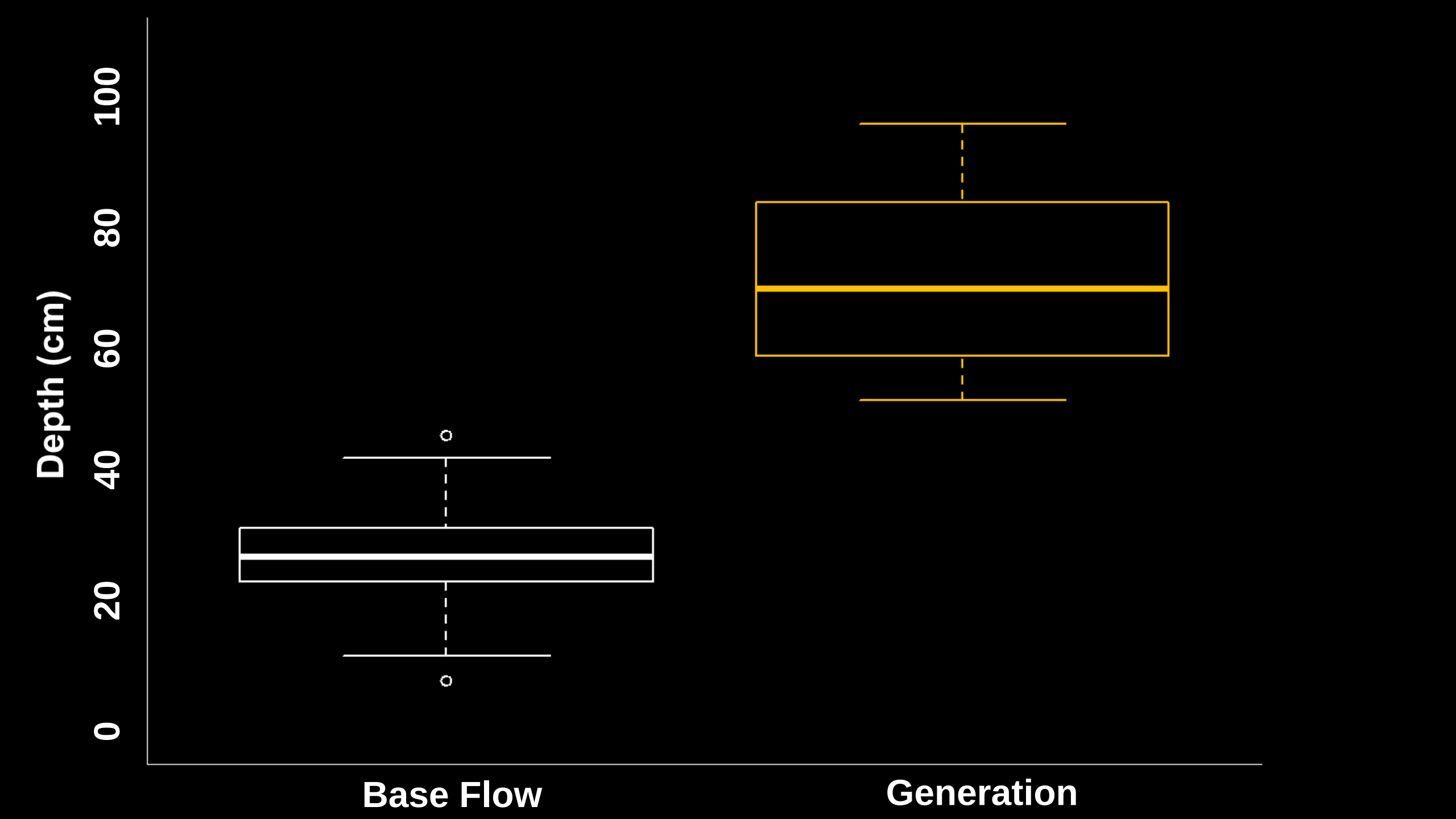
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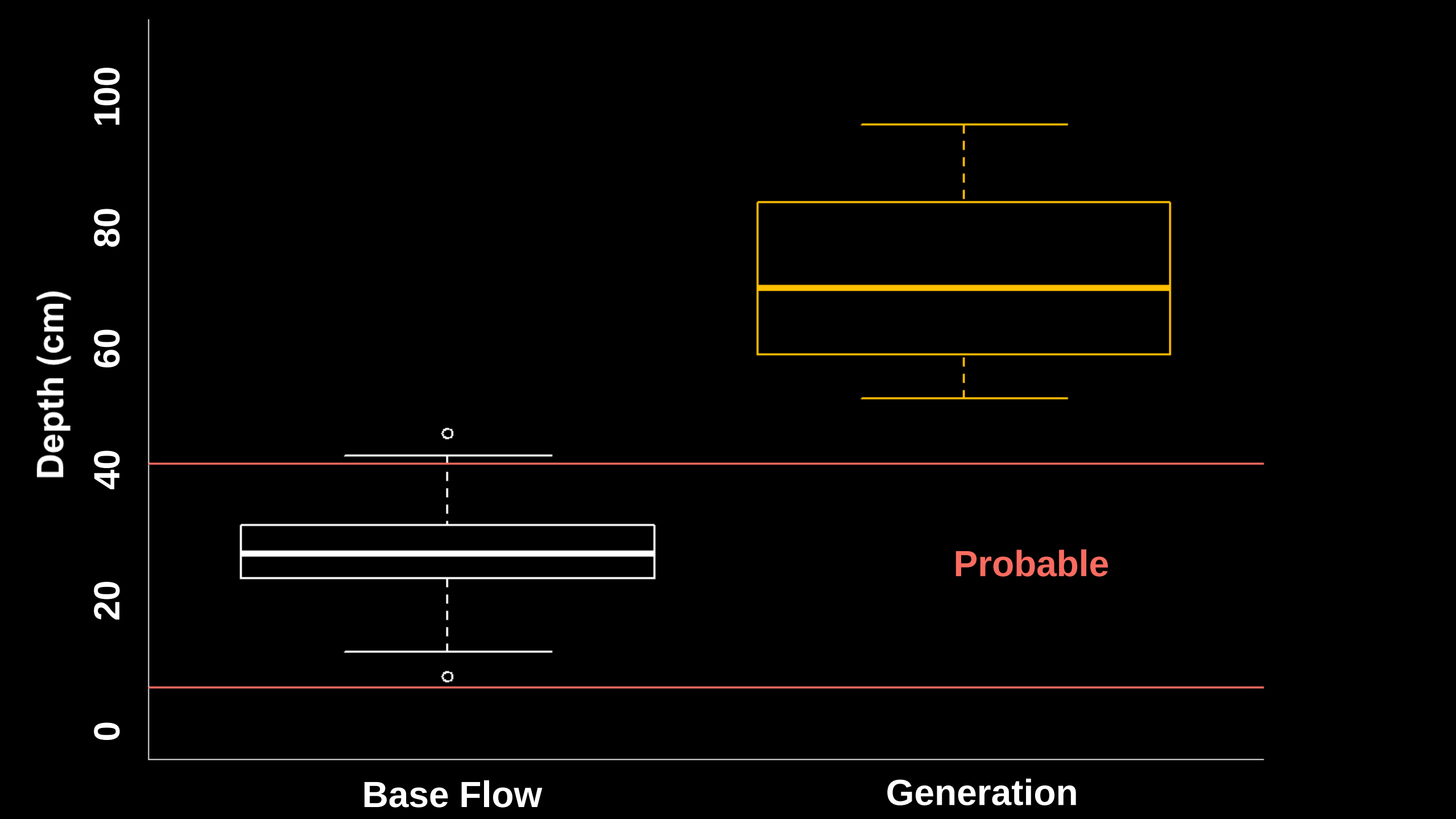
80
100
Base Flow
Generation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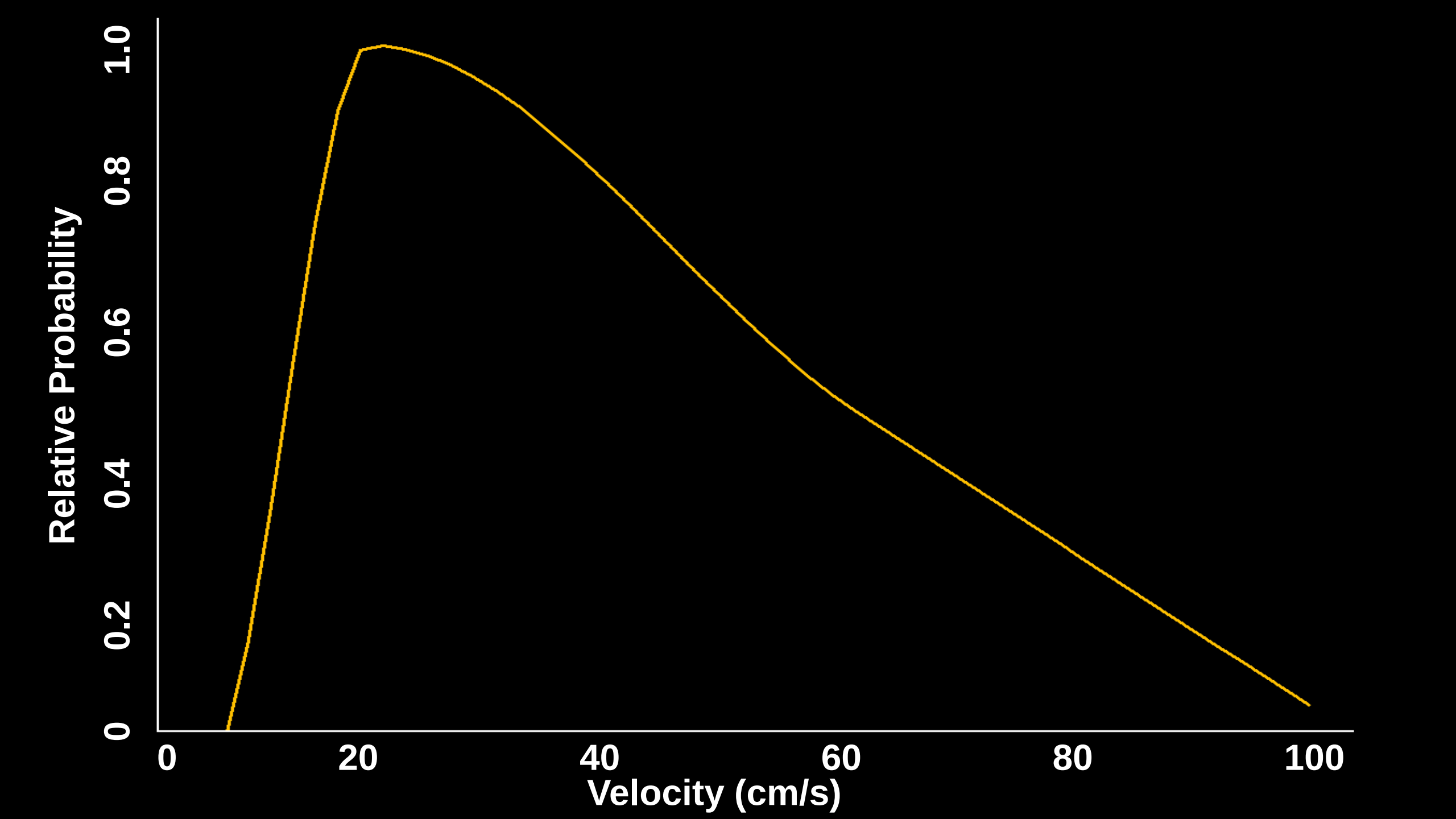
60
80
100
Probable
Base Flow
Generation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0.8
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0
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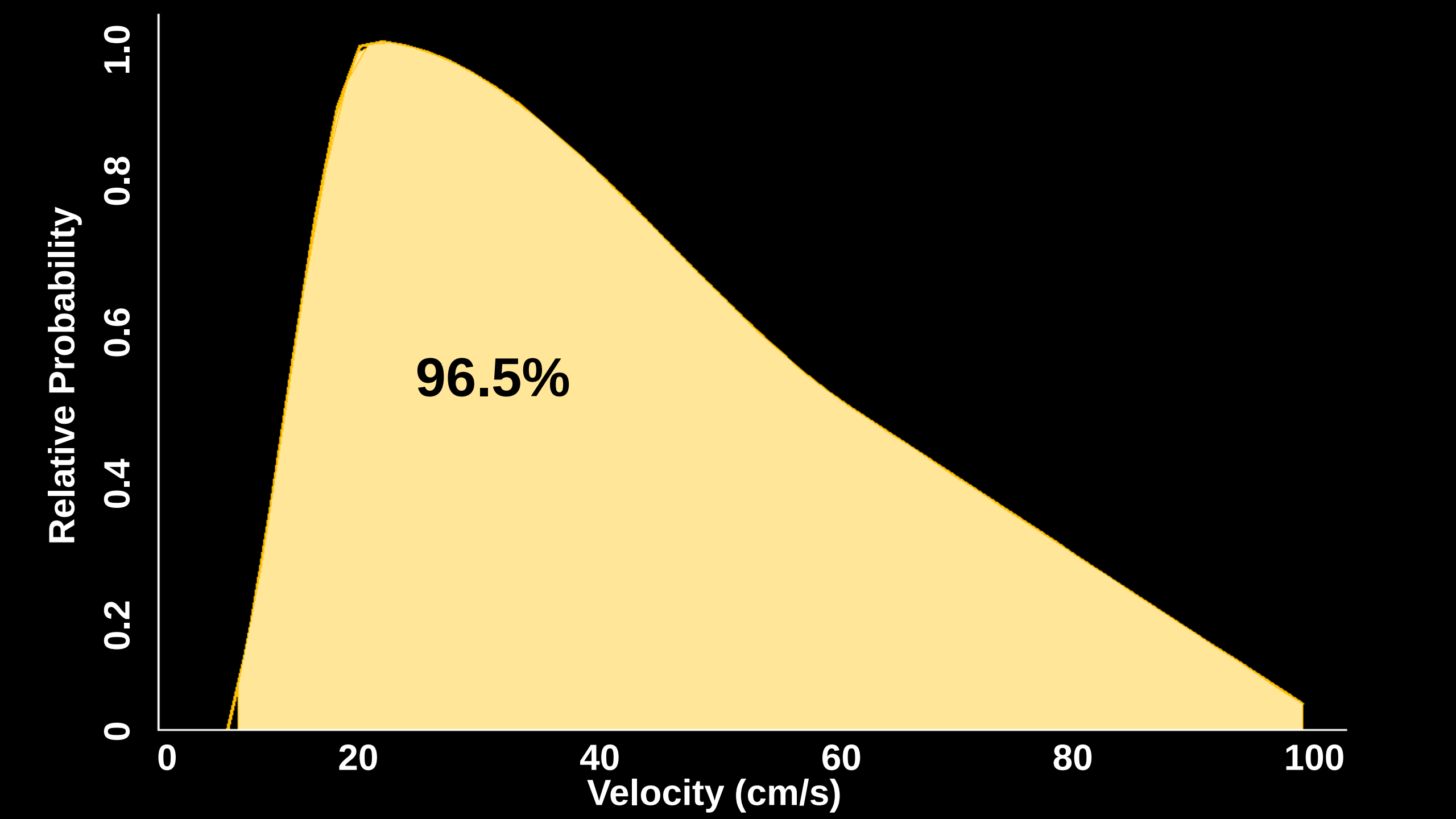
40
60
80
100
Velocity (cm/s)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96.5%
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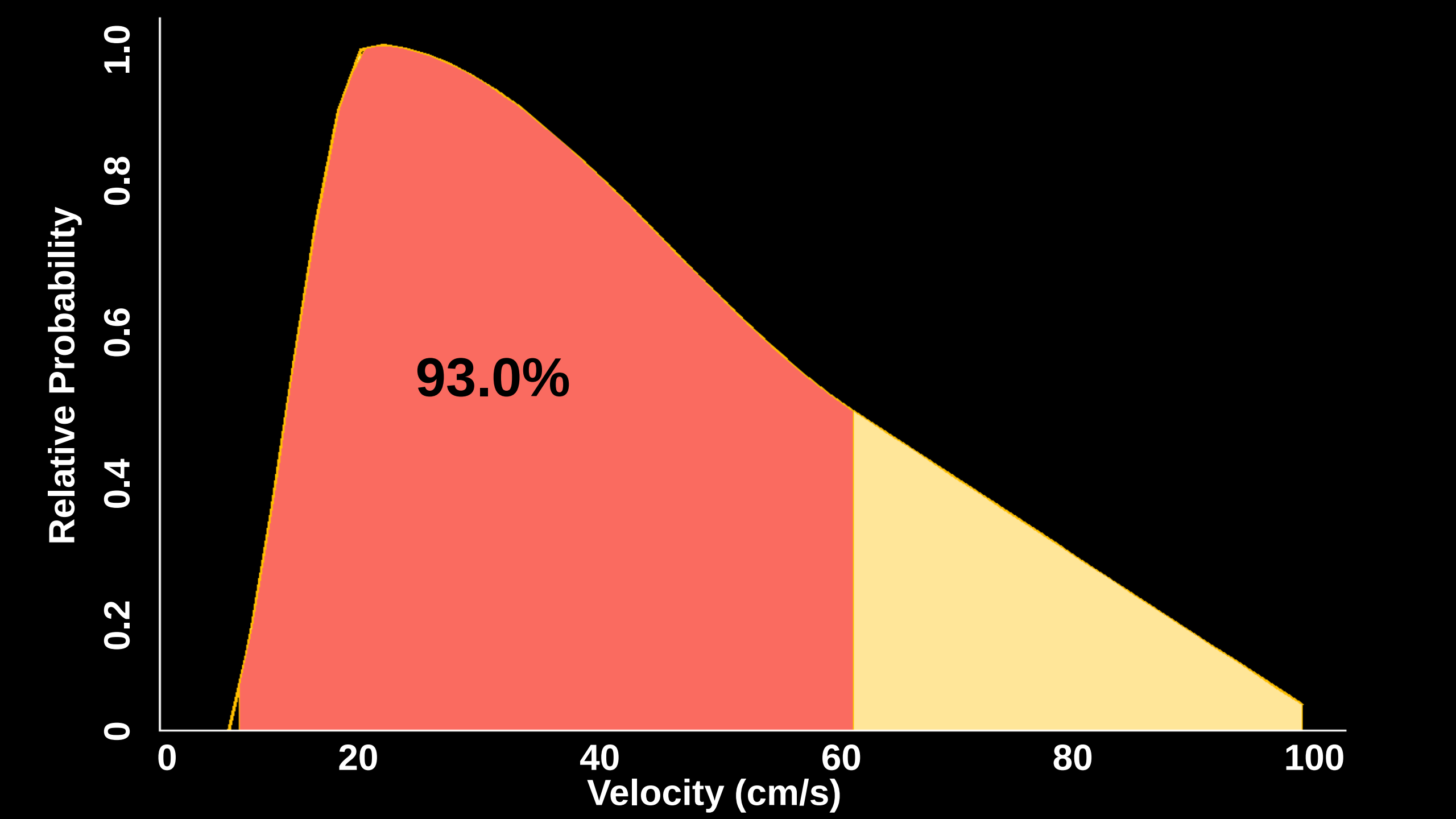
Velocity (cm/s)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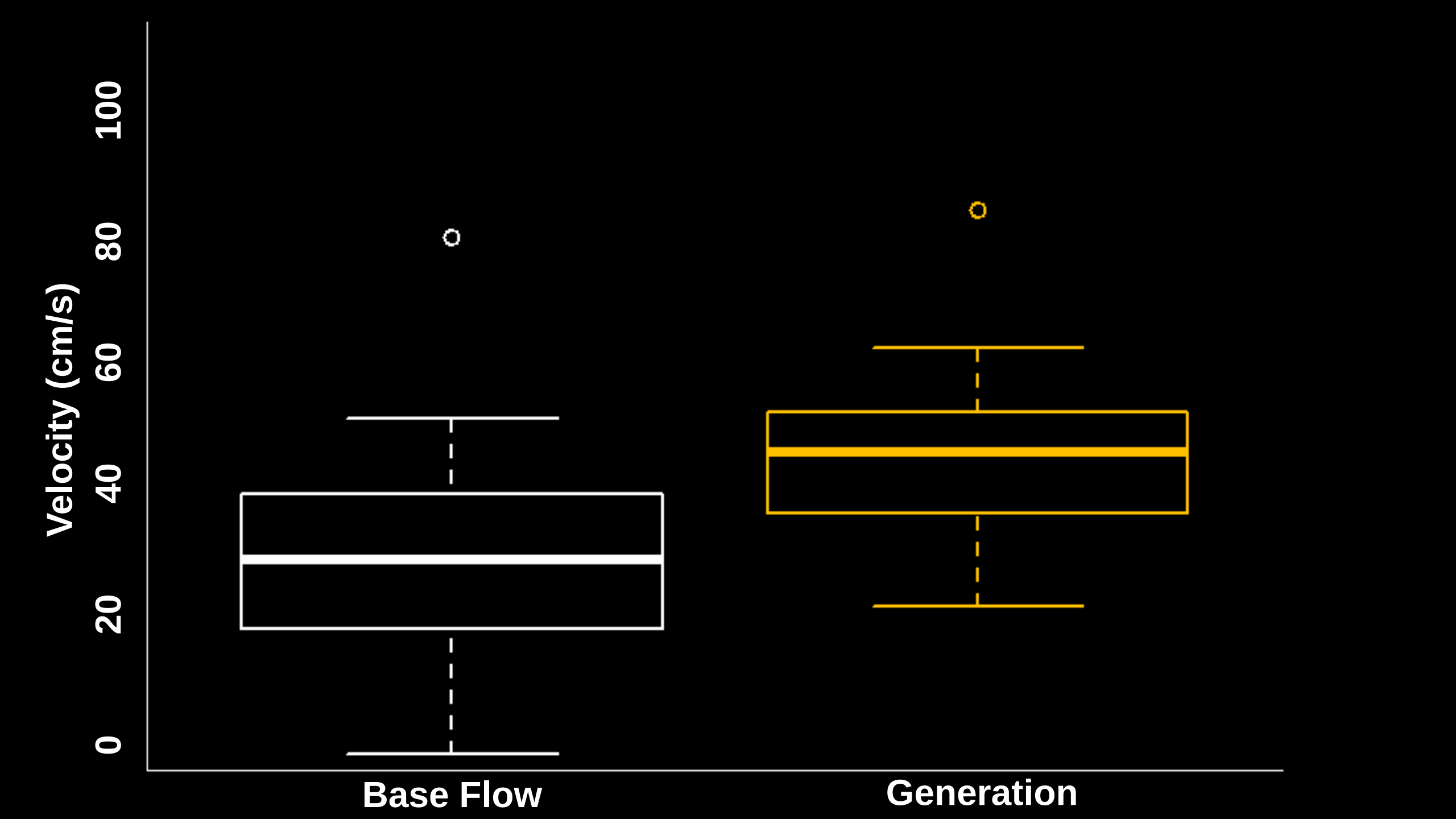
Velocity (cm/s)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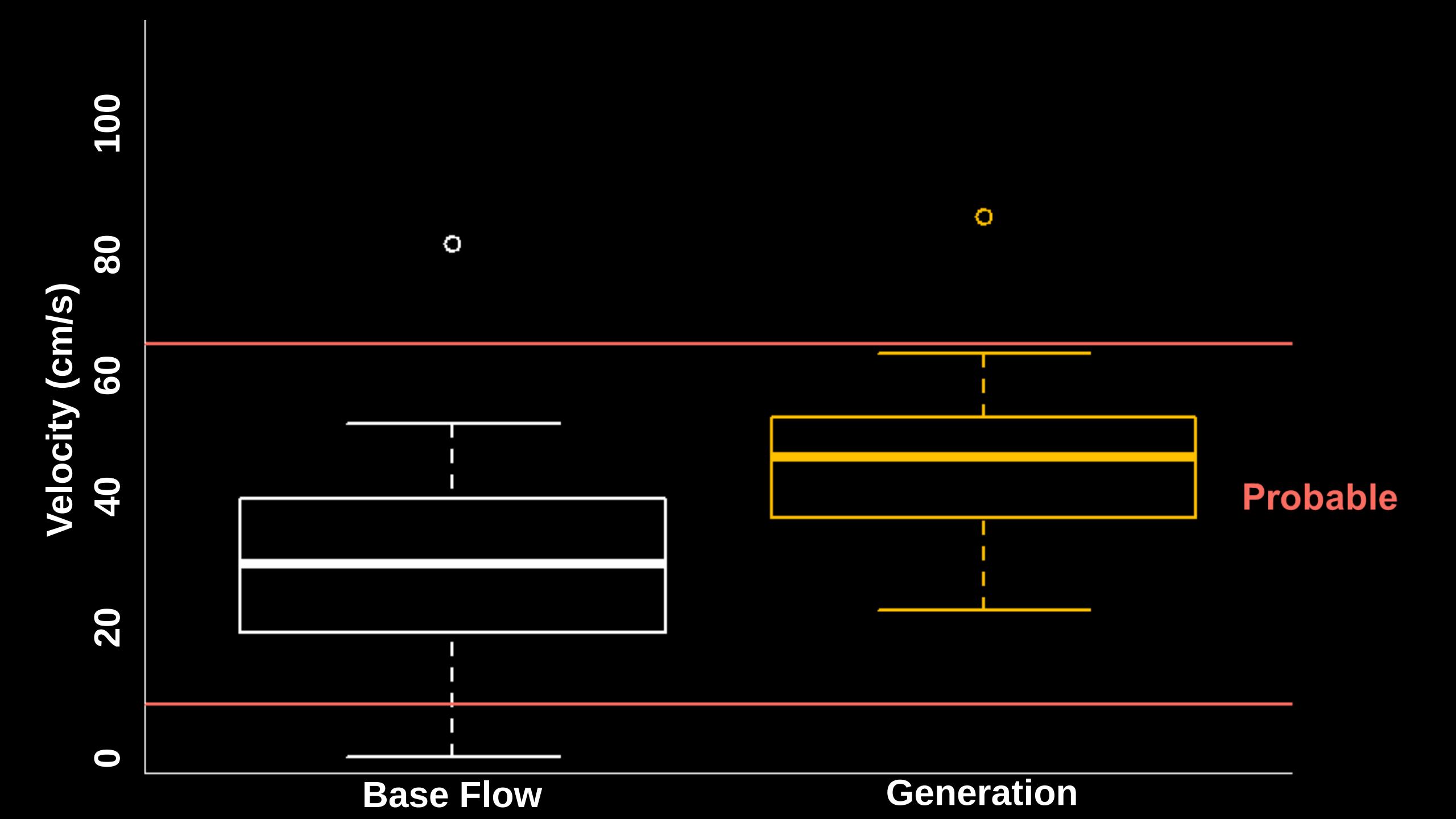
Base Flow
Generation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Base Flow
Generation
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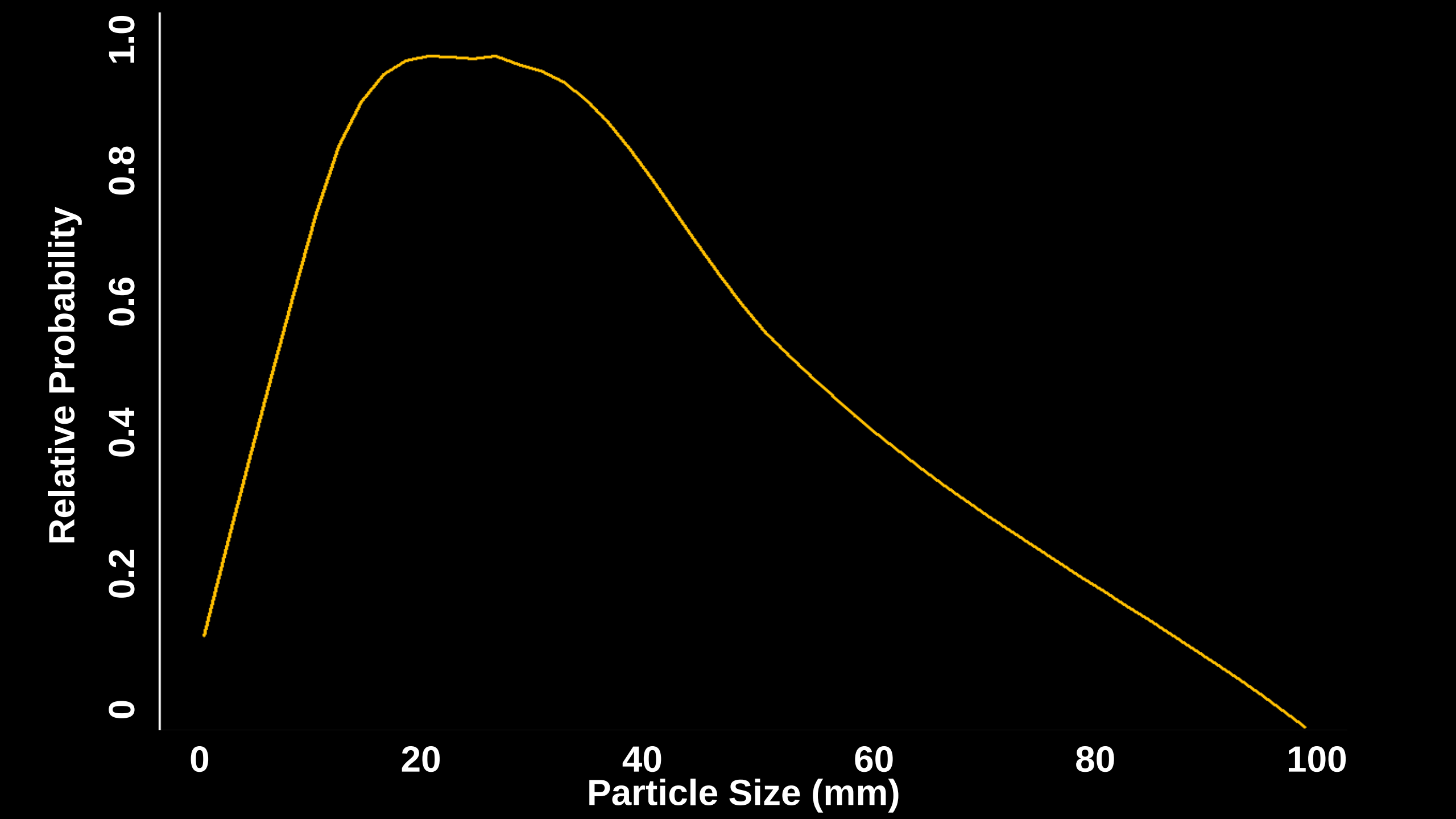
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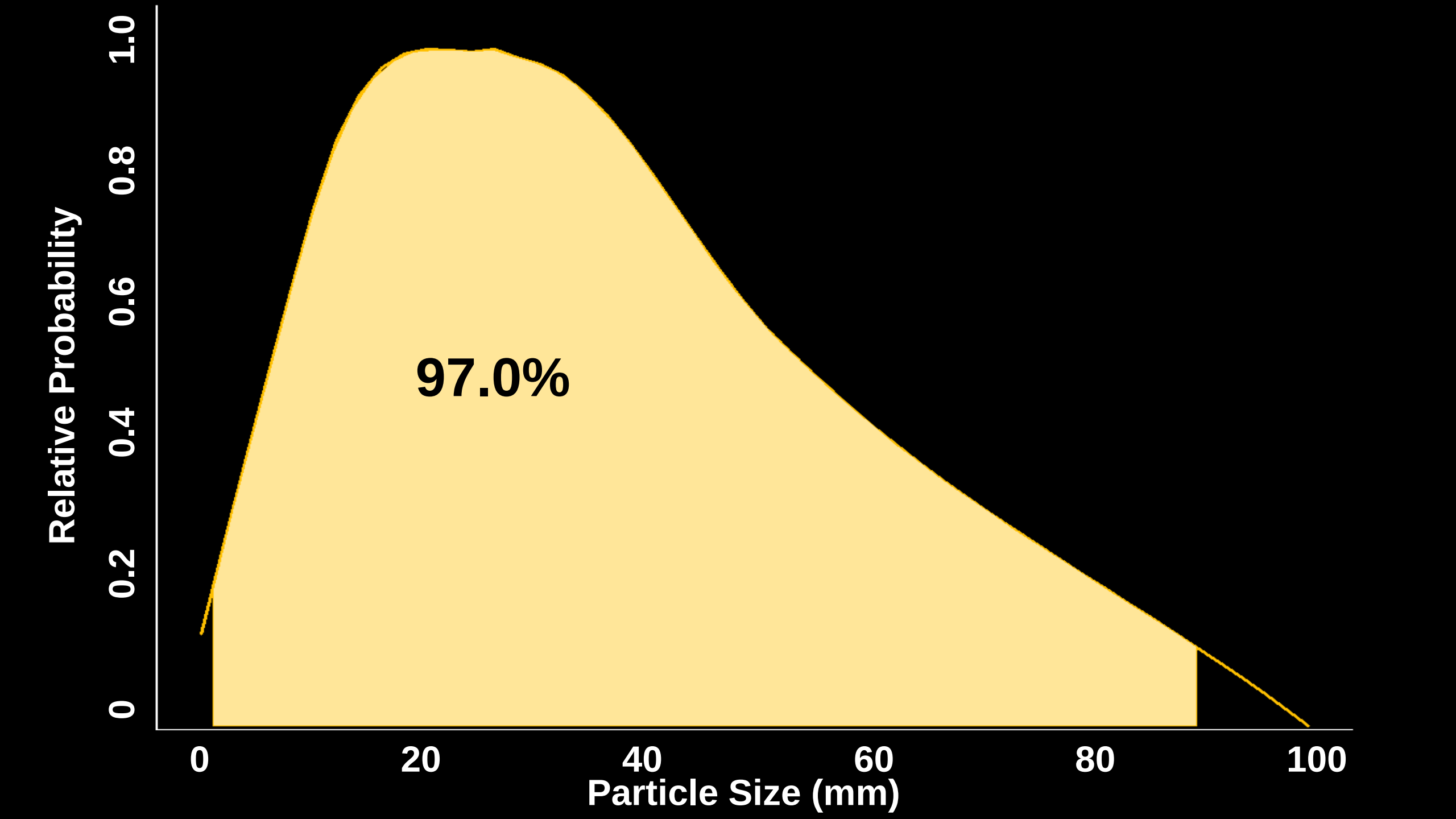
60
80
100
Particle Size (mm)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80
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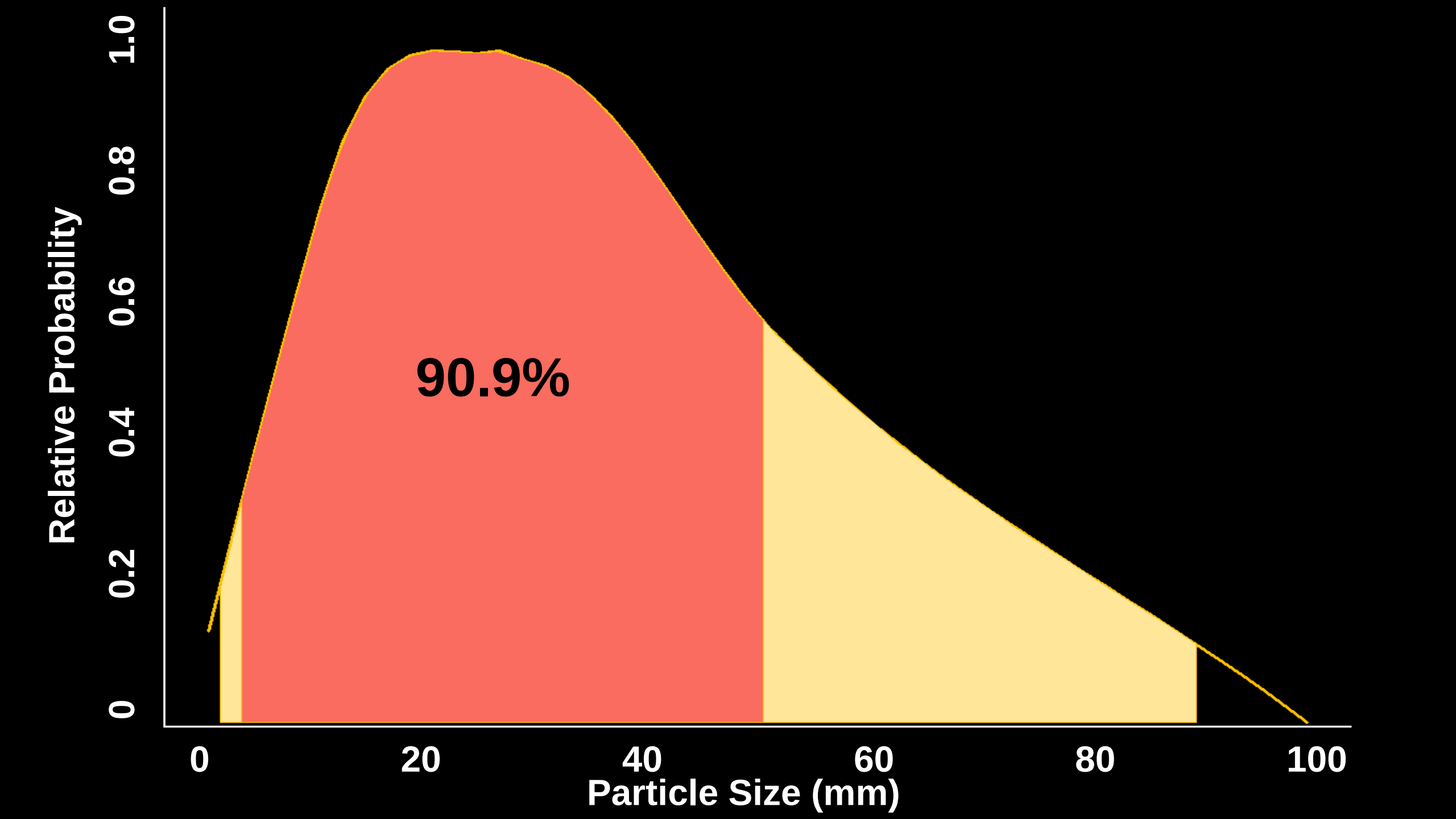
Particle Size (mm)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0.4
0.6
0.8
1.0
90.9%
0
20
40
60
80
100
Particle Size (mm)

Generally the best predictive models are constructed with data from the system

So……..

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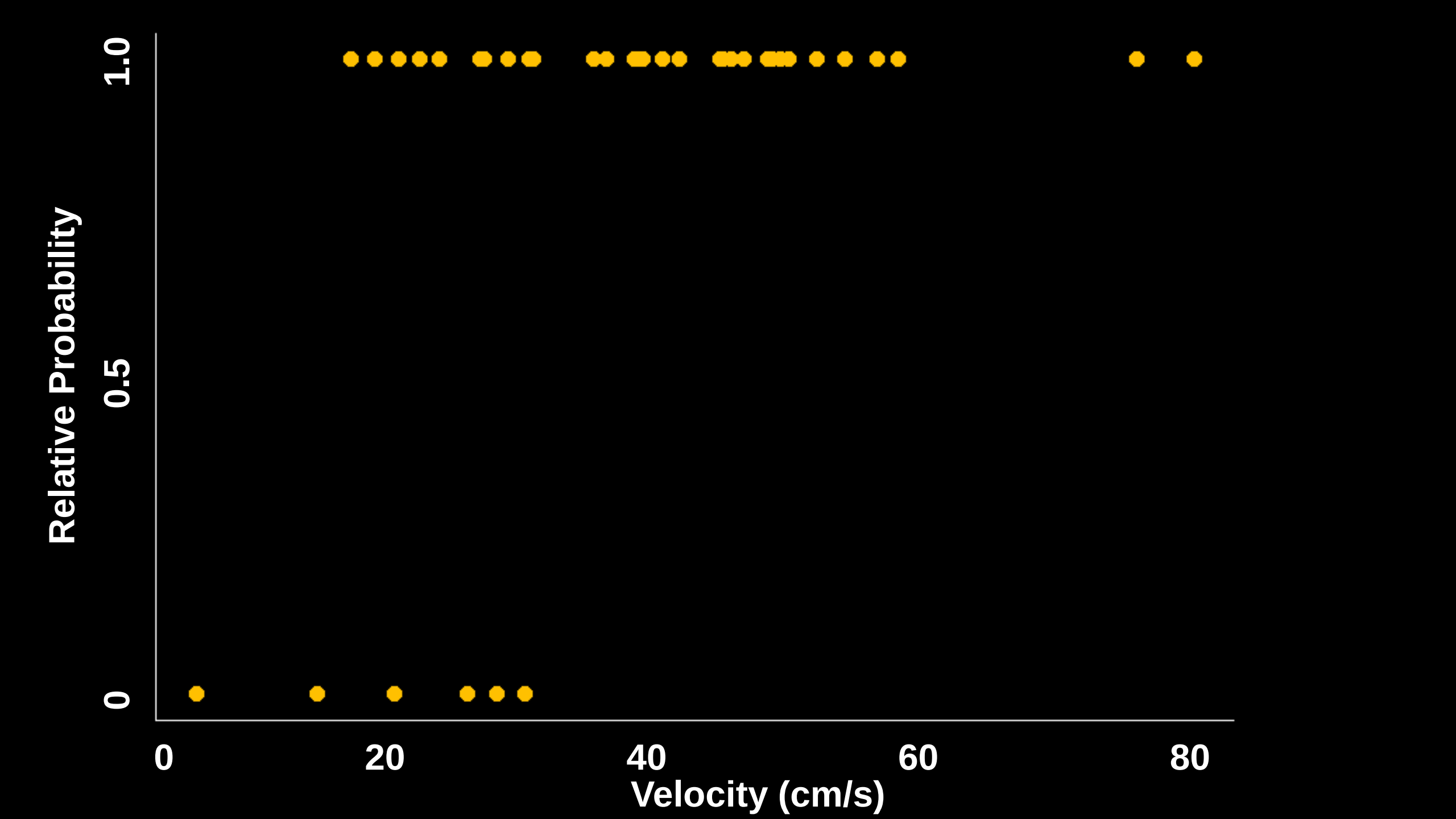
So……..

What if we want to develop a predictive model with data from the GFTW?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0
20
40
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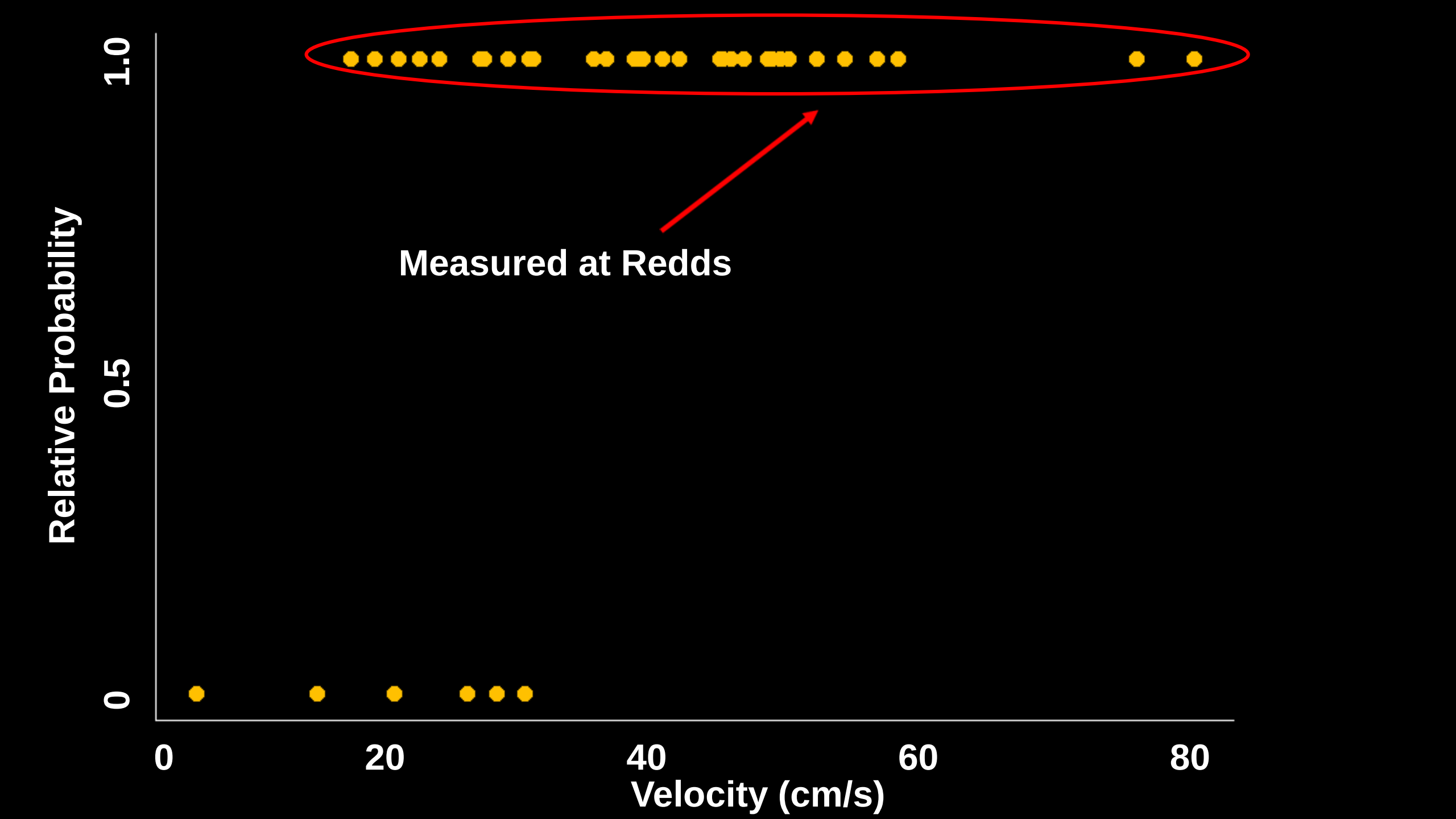
Velocity (cm/s)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Measured at Redds
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60
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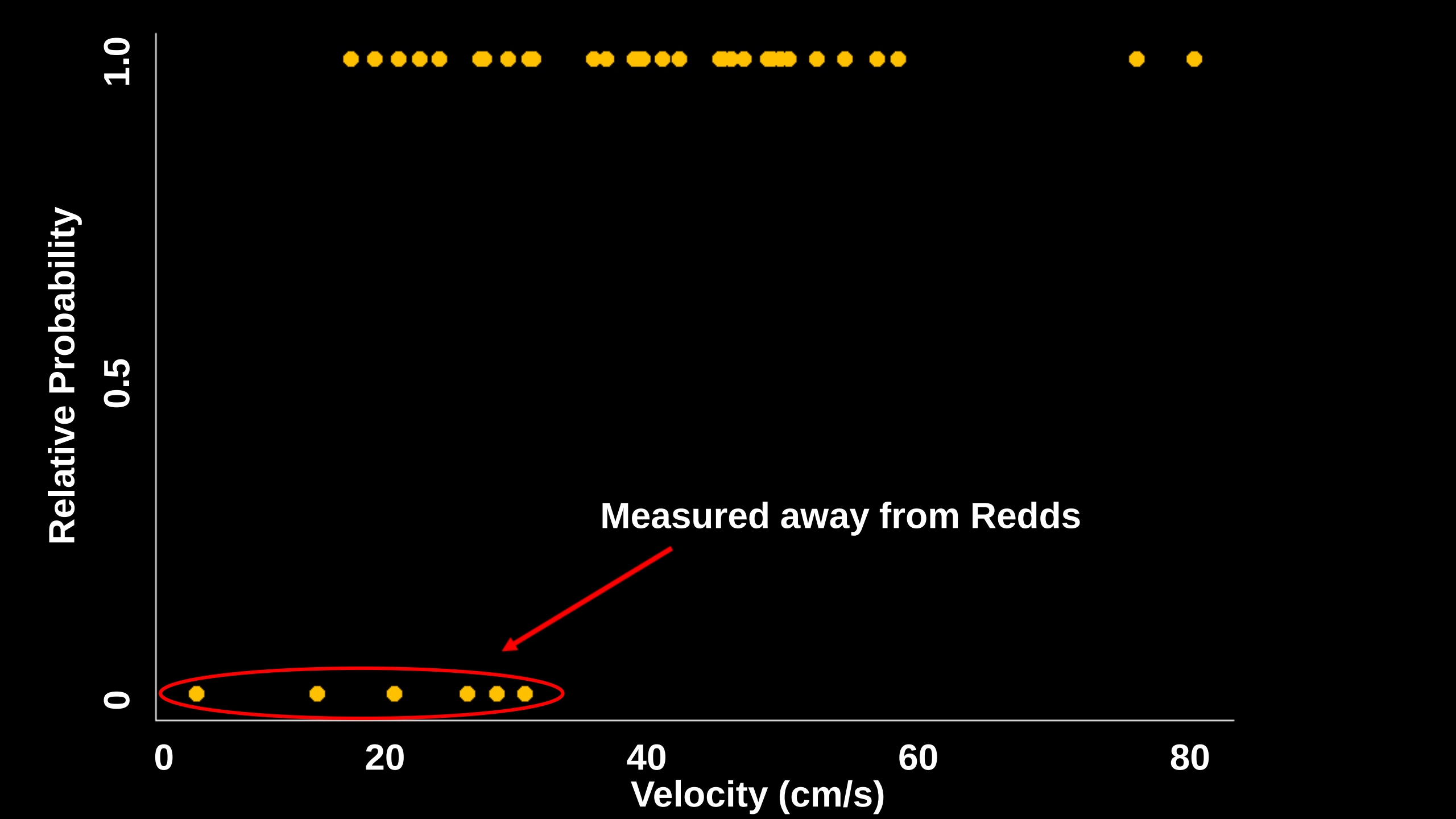
Velocity (cm/s)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Measured away from Redds
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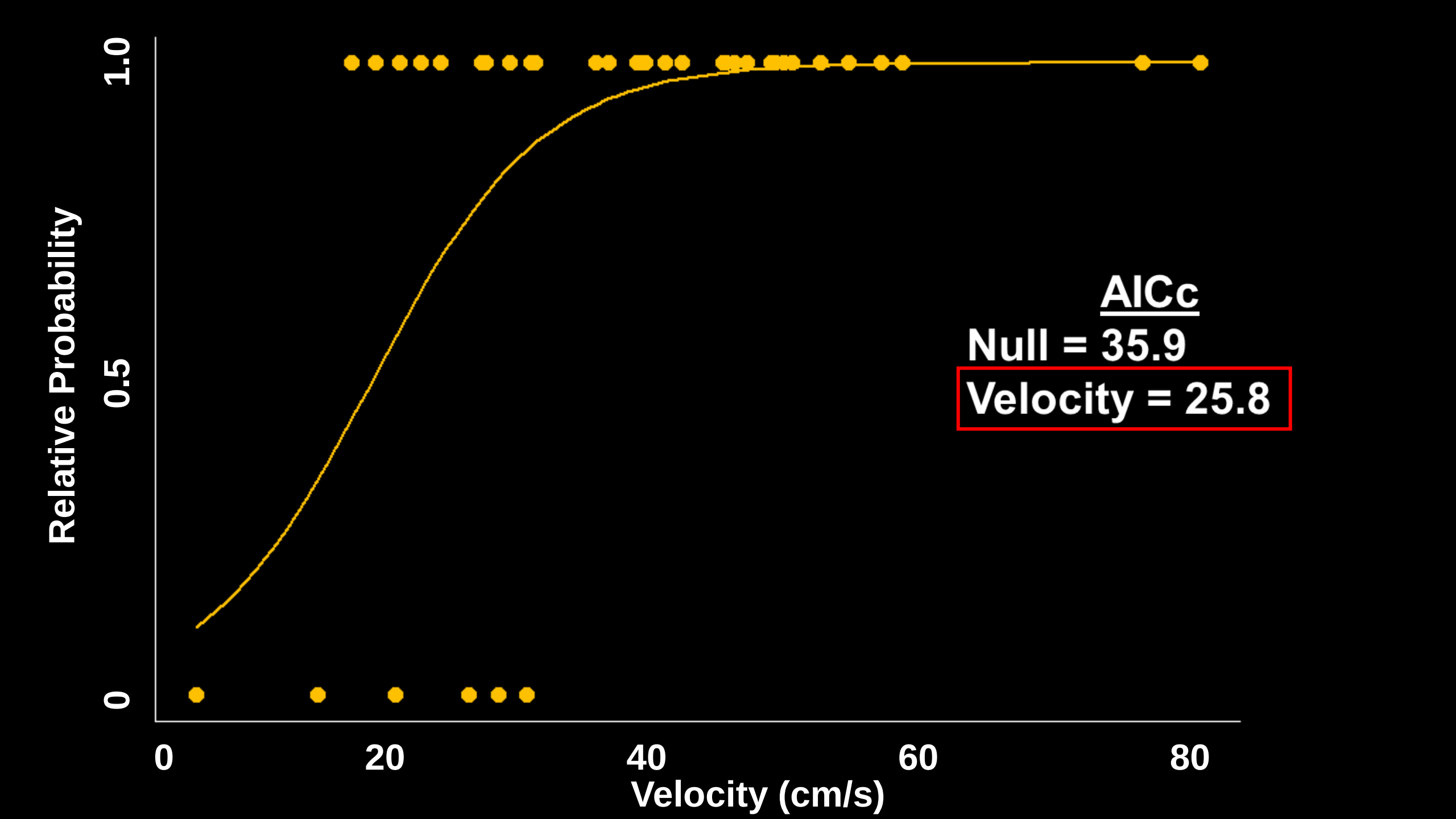
Velocity (cm/s)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0
20
40
60
80
Velocity (cm/s)
AICc
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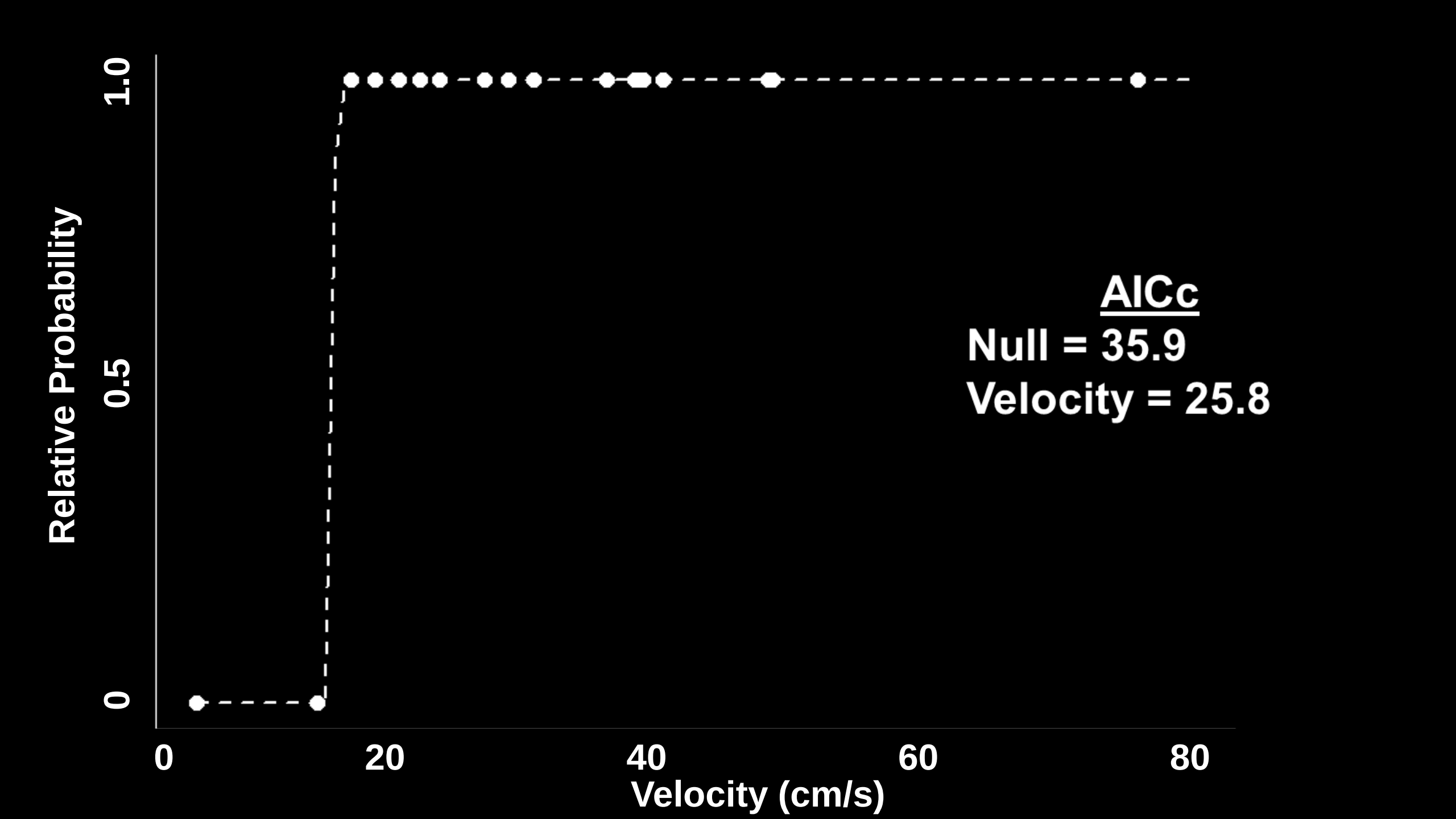
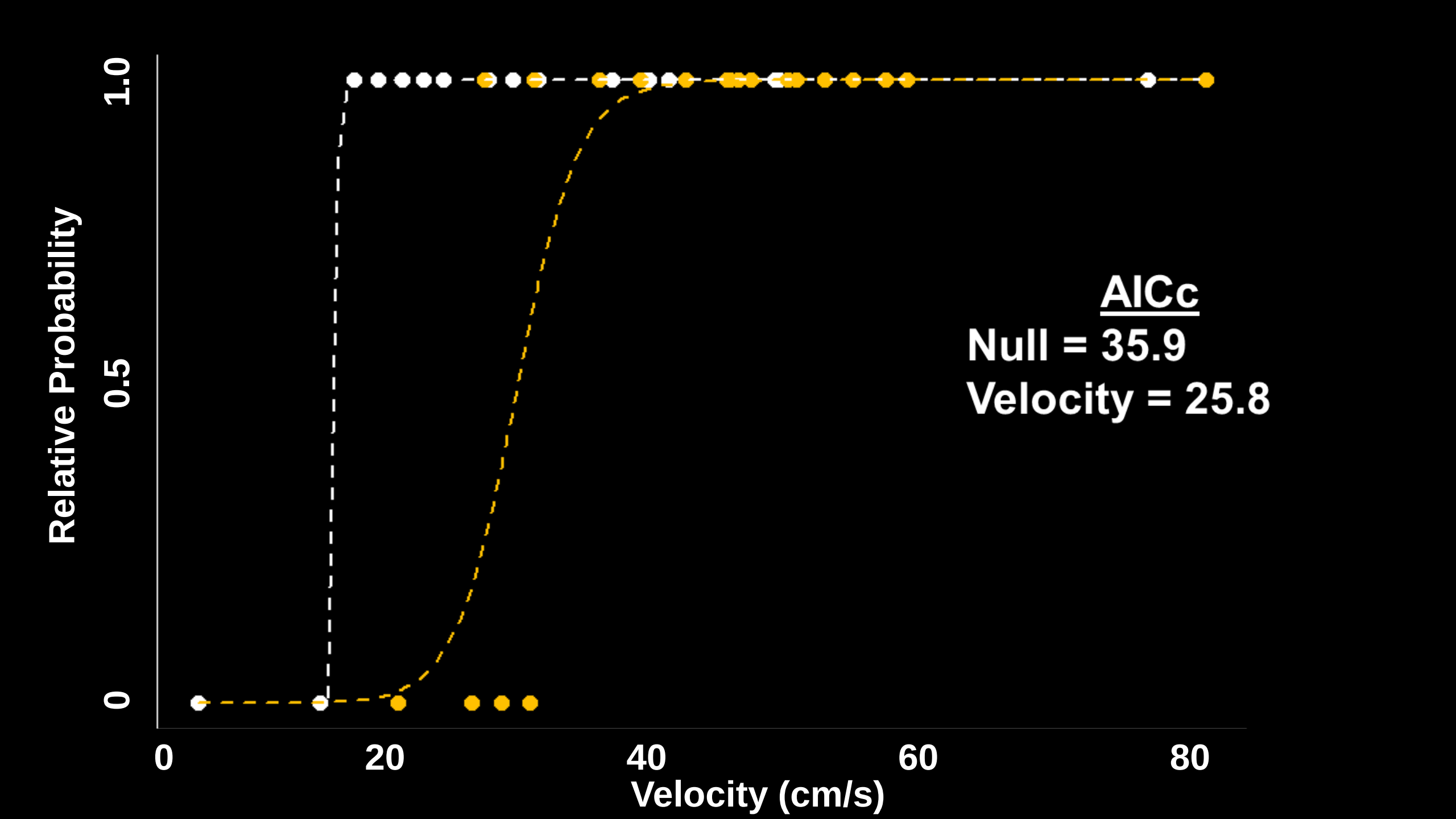
Velocity = 25.8


Relative Probability
1.0
0.5
0
0
20
40
60
80
Velocity (cm/s)
AICc
Null = 35.9
Velocity = 25.8


Relative Probability
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Velocity (cm/s)
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Null = 35.9
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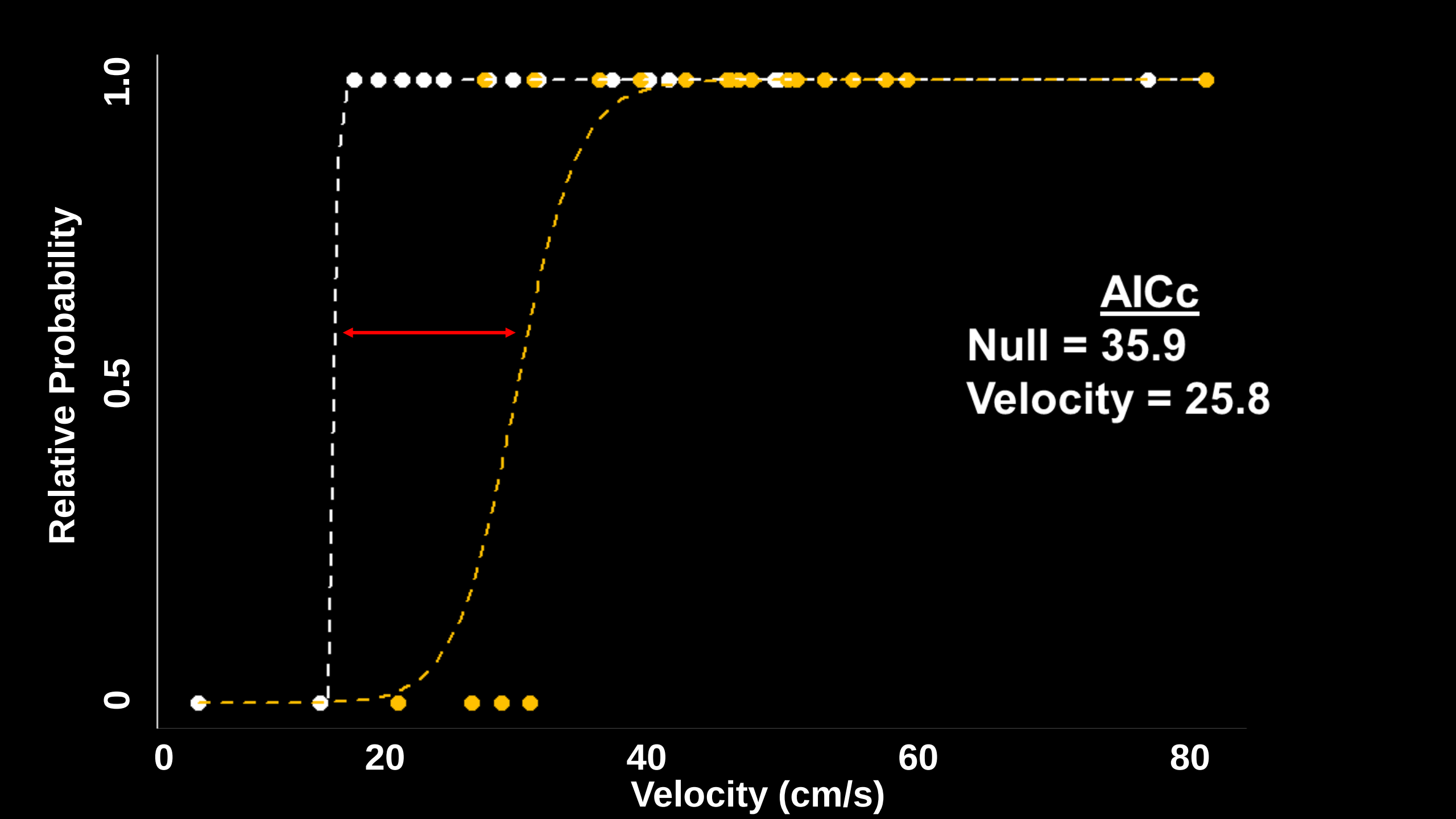
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Velocity (cm/s)
AICc
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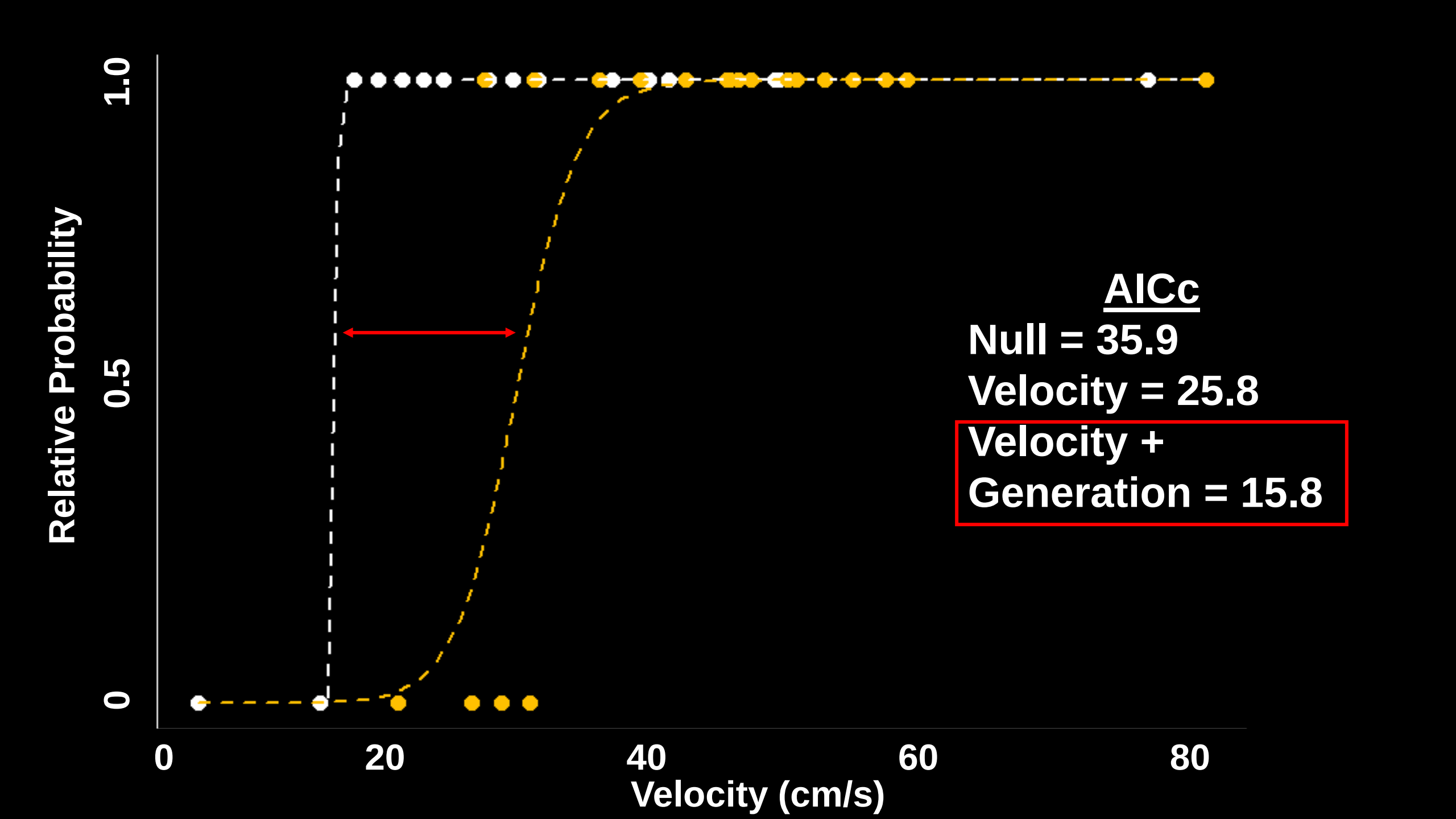
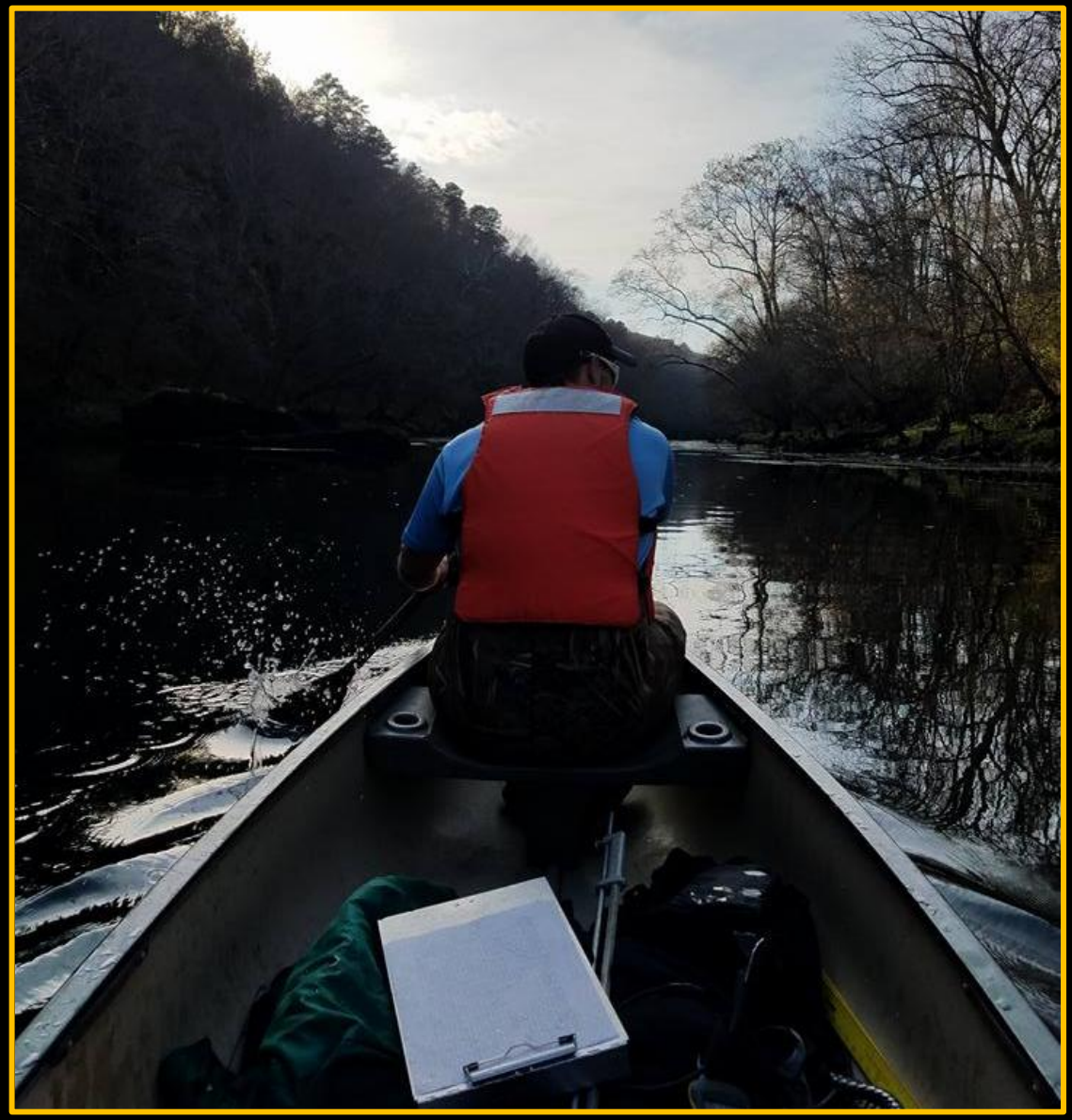

Relative Probability
1.0
0.5
0
0
20
40
60
80
Velocity (cm/s)
AICc
Null = 35.9
Velocity = 25.8
Velocity + Generation = 15.8

Future Work

- Monitor hatch and emergence times
- Generalized suitability curve work and testing
- Comparison of field measurement metrics
- Data collection at higher water levels and flows

Conclusion

- Spawn time variable between tailwaters
- Generalized suitability curves apply to GFTW
- Water velocity appears to drive redd presence
- Generation affects predictive modeling



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