D39 Field Observations of Bone Deposition in Six Rivers

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After attending this presentation, attendees will learn about the current hypotheses of bone transport and deposition within fluvial (river) systems and field evidence that suggests which parts of these hypotheses are valid and how this information could help investigators make informed decisions concerning searches for additional skeletal material from disarticulated and scattered remains.

This presentation will impact the forensic community and/or humanity by demonstrating what parts of existing bone transport theory are supported by observations from the real world as well as what gaps exist in understanding leading to more focused searches for skeletal remains and higher success rates in additional bone recovery. Once the accuracy of the current theory is determined as well as its deficiencies, a predictive theory of bone transport and deposition that can guide the recovery of skeletal remains found in rivers, can be identified.

Attendees will be exposed to the current hypotheses of bone transport and deposition within fluvial (river) systems, and field evidence that suggests which parts of these hypotheses are valid. This information could help investigators make informed decisions concerning searching for additional skeletal material from disarticulated and scattered remains.

Huzzah Creek (Missouri), Levelock Creek (Alaska), a tributary of the El Kejanero River (Kenya), Lugga Maji Chumvi (Kenya), Lugga Mbololo (Kenya), and an unnamed Lugga (Kenya) were all surveyed on foot or by swimming for their modern bone contents. When skeletal material was located information concerning its orientation, burial, modifications, and geologic context were recorded. The resulting observations were compared to the predictions made by previous authors concerning bone transport and deposition to determine which hypotheses are supported by the evidence. Field data was also compared to flume data to determine how applicable such experiments are to real world fluvial systems.

The preliminary data suggests that the author's current hypotheses concerning bone transport and deposition are incomplete however portions are supported by the field evidence. Flat bones lie against the river bed and do not appear to be moving rapidly. Long bones are generally found parallel or perpendicular to flow and likely have variable transport velocities. Long bone shafts that have been cut on either end orient themselves parallel to flow, do not move readily, and are deposited over rapidly. Small bones or bones of irregular shape tend to be transported faster than other bones. Bones with concavities tend to lay concave surface downward and move slower compared to other bones. Lastly bones are preferentially found in places of lowered flow velocity, like behind obstructions or vegetation. Limited observations also suggest that articulated units tend not to move as fast as isolated skeletal elements and large clasts and high energy are needed to produce marked rounding on bone surfaces. These observations are largely consistent with data from flume experiments with bones however a detailed comparison is not possible since the skeletal sample analyzed here is not large enough yet.

Additional observations were made that complicate the understanding of bone transport and deposition, including the presence of scour pits in the river bed above bones, which was not predicted or observed in flume experiments previously.

Practically the information in this talk will inform investigators what parts of existing bone transport theory are supported by observations from the real world as well as what gaps exist in understanding. This would translate in to more focused searches for skeletal remains, hopefully with higher success rates in additional bone recovery. Ultimately a predictive theory of bone transport and deposition is desired, one that can guide the recovery of skeletal remains found in rivers. However the first step is to determine the accuracy of the current theory, then identify deficiencies and fill the gaps as needed.

Future research should focus on a comparison between experiments performed in the laboratory in conjunction with actualistic experimentation in fluvial settings. Since human remains are difficult to experiment with in the wild, an understanding of how different physical features of bones alters transport is desired, so the developed theory can be applied more readily to human remains.

Fluvial, Deposition, Bones

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