

Experimental Characterization of Basketmaker II Atlatl and Dart Systems as Combat Weapons: Technological Limitations and Implications for Combat Dynamics and Social Organization



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Background:

Over the years, there has been much speculation as to what social conditions effected the shift from atlatl to bow in North American prehistory. Tomka suggests that the main factor effecting the shift from atlatl to bow would be the type of game targeted by hunters¹. Similarly, T. L. VanPool interprets the shift from atlatl to bow in terms of the faunal resources being targeted by hunters, with bows preferred for smaller game, and atlatls preferred for large game². It is important to note, however, that the atlatl is a tool which functions both as a hunting implement and as a weapon, and both purposes must be considered when interpreting the shift between these projectile systems. Reed and Geib identify 3 factors as dominant in considering the atlatl/bow shift: learning curve (it is easier to learn to use a bow than an atlatl), body motion which alerts the hunted game to the hunter's presence (atlatls require large motions to use effectively), and the greater amount of space required around the hunter in which to throw an atlatl vs. to shoot a bow. Reed and Geib conclude that warfare is not likely the cause of the shift, as the adoption of the bow does not appear to be temporally linked to increased warfare, but that warfare did increase following the shift, as a result of increasing social complexity due in part to improved weaponry technology³. As there is a poverty of information in the literature regarding the use of the atlatl and dart as combat weapons, the present study is being conducted in an effort to gain experiential insight into the nature of atlatl combat. The low velocity of atlatl darts (between 45 and 60mph for replicas of Basketmaker II atlatl darts vs. twice that for arrows) proved to be a significant factor in their use as combat weapons. Combat exercises were conducted at a range of 10 yards, as at greater distances darts were too easy to dodge. The low speed of the projectiles, not their accuracy, proved to be the most limiting factor in this experiment. Equipment used is shown below (figure 1).



Figure 1: Atlatl and dart equipment used in the experiment. Pictured are two atlatls, three of six blunted darts, and a cattail stem "club". Heads on darts are composed of closed cell foam. Despite the padding on the darts, participants in the experiment wore protective gear (fencing jackets, baseball pitcher's chest protectors, a fencing mask, and a modified catcher's helmet with an acrylic face shield were used) to protect against injury in the event of a broken dart shaft. Dart dimensions are typical of Basketmaker II artifacts. Shafts were made of *Arundinaria Gigantea* culms. All darts were originally made for hunting.

The experiments:

Outcomes of engagements at 10 yards (atlatlist vs. atlatlist)

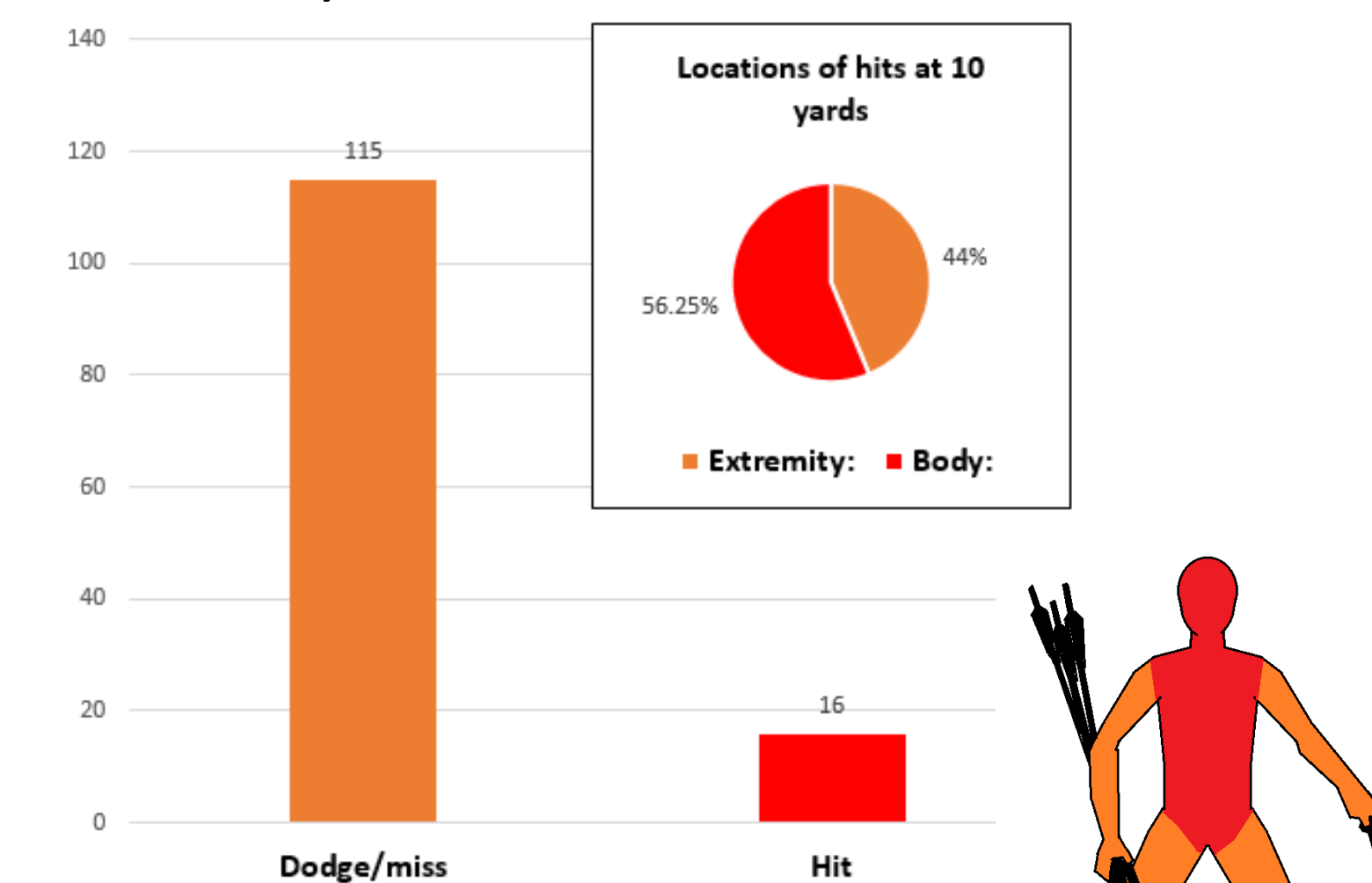


Figure 2: Outcomes of engagements at 10 yards. Two combatants stood 10 yards apart and exchanged throws. Each atlatlist began each engagement with 3 darts, and throws were exchanged until no darts remained. 131 darts were thrown in the course of this portion of the experiments. At a fixed distance of 10 yards, 87.79% of throws resulted either in successful dodges or misses. Of the 12.21% of throws which resulted in hits on the opponent, slightly more than half impacted the body, slightly under half hit the extremities (see inset above) in this experiment, "body" was defined as the trunk and head (see drawing above) and "extremities" as the arms, hands, and legs.



Figure 3: Experiments in progress. Distance between participants is 10 yards. At top, Devin Pettigrew (right) throws a dart at the author (left) who is preparing to return "fire". At bottom, Devin Pettigrew wields a club, and strikes a menacing pose as the author prepares to throw the first of three darts at him.

Outcomes of engagements at 10 yards (atlatlist vs. club-wielder)

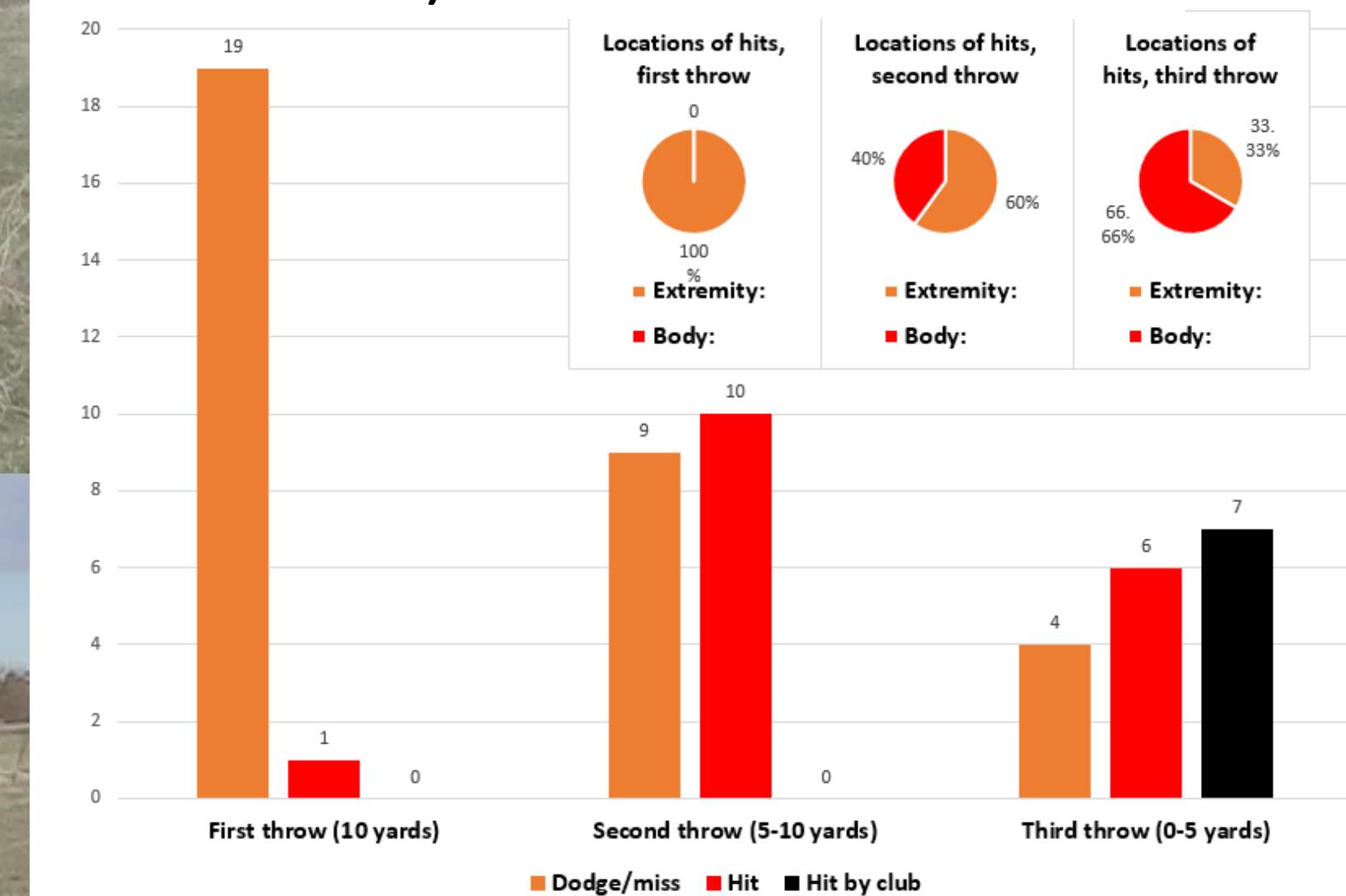


Figure 4: Outcomes of engagement with club-wielder. For this set of experiments, one combatant was outfitted with an atlatl and three darts, and the other outfitted with a soft club fashioned from a cattail stem. Engagement began at 10 yards, and following the first throw the club-wielder would dodge and attempt to evade the remaining throws, while closing the distance between themselves and the atlatlist. As can be seen above, dodging was very efficient at 10 yards, but became more difficult as distance decreased. When the distance closed to around 5 yards, the club became as efficient a weapon as the atlatl. In 5 cases, the club-wielder was able to hit the atlatlist before a third dart could be loaded.

Implications and further research:



Figure 5: Use of shield to defend against incoming atlatl darts at 10 yards. Shield is 14" in diameter, and proved to be extremely efficacious in defense against Basketmaker II darts. In early preliminary experiments, both combatants achieved better than 90% success at blocking darts. After some degree of familiarity with the gear was established, this increased to a 100% success rate in the final experiment, in which Devin Pettigrew blocked 30 darts in a row.



Figure 6: The author (in the role of club-wielder) successfully evades the atlatlist's last dart, and prepares to engage.

This set of experiments (figures 2-6), while still preliminary, suggests that the low projectile speed of atlatl darts relative to bow-shot arrows presents a significant disadvantage in human conflict. Even at engagement distances of as little as 10 yards, a combatant's reaction time allows them to relatively easily sidestep or dodge incoming projectiles. It is important to note that the test subjects (the author and fellow atlatl researcher Devin Pettigrew) are both proficient users of atlatls both in sport and in hunting, and have no specific training in atlatl combat. Even so, both participants were able to effectively dodge nearly all projectiles thrown from 10 yards. The atlatl's intrinsic accuracy is reasonably good at short range; Whittaker and Kamp found through analysis of World Atlatl Association ISAC (International Standard Accuracy Competition) scores that at ranges of 15 to 20 meters, atlatl accuracy in the hands of the most skilled users is sufficient to hit a target between the size of a dinner plate and a human torso 10 out of 10 times⁴. While some sources have suggested that the atlatl has a higher rate of fire than the atlatl⁵, but this project has shown the actual rate of fire to be equivalent between a Basketmaker II atlatl and a 50lb American Flatbow (figure 7). This information, coupled with the results of these experiments conducted at 10 yards tend to suggest the limiting factor of the atlatl in combat as not being related to rate of fire or accuracy, rather due to low projectile speed and potentially low ammunition capacity. These conditions can be expected to exert a large influence on how the atlatl functioned in interpersonal conflict, and must be understood in order to make meaningful inferences about the nature of the shift from atlatl to bow. It is possible that the atlatl is a selected for in situations of group combat where individuals can be distracted before being targeted and hit while distracted, or in small scale societies who do not engage in warfare proper, but in skirmishes and intertribal violence in which the primary purpose of conflict is posturing, but efficient killing of the enemy is not a prime consideration, and cross-cutting ties must be maintained between kinship groups for security in times of economic scarcity. This model would be analogous to certain ethnographic tribal warfare, particularly in Highland New Guinea⁶. More combat exercises are being planned, including scenarios involving multiple combatants.

References:

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- 3: Reed, Paul F. and Geib, Phil R., 2013. Sedentism, Social Change, Warfare, and the Bow in the Ancient Pueblo Southwest. *Evolutionary anthropology*, 22(3) 103-110
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Shots per minute, atlatl vs. bow

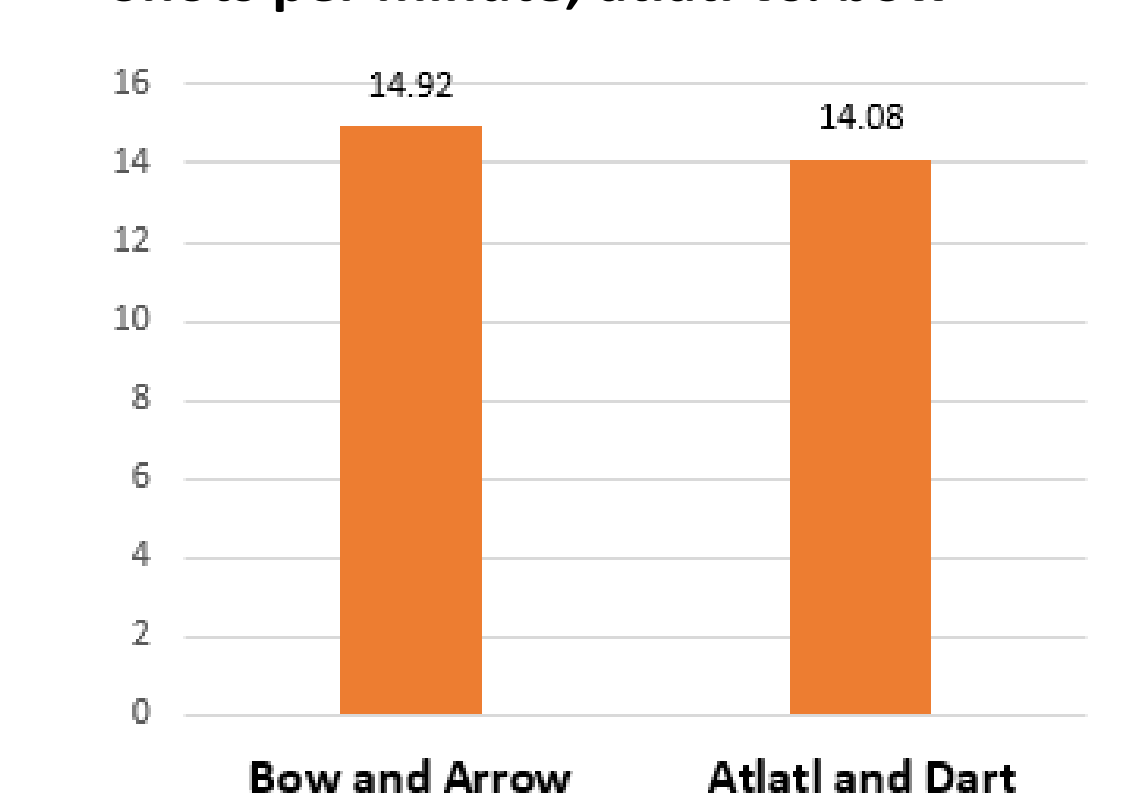


Figure 7: Atlatl and dart rate of fire in shots per minute, compared against a bow and arrow. 3 sets of 10 shots each were performed for each weapon system, and the results averaged.

