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Resource Holding Potential

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Synonyms

Fighting Ability; Resource holding power

Definition

Morphological and physiological traits affecting the ability to win a direct competitive contest over a limited resource.

Summary

Animals use contests, with displays and/or fighting, as direct competition to resolve disputes over finite resources (Parker, 1974; Rudin and Briffin, 2012). The resources fought over can affect their fitness either directly (e.g., mating opportunities) or indirectly (e.g., food) (Palaoro and Briffa, 2017). The contests are frequently decided when one of the individuals withdraws from a fight or refuses to engage, and less frequently by one individual killing another. Morphological and physiological traits determining the potential to win these contests are defined as an individual's resource holding potential (RHP). The concept was initially proposed by Parker (1974) who referred to it as the 'resource holding power'. Traits typically considered to determine RHP include body mass, body size, weapons, contest experience, and physiological state (Batchelor et al., 2012; Hsu and Wolf, 2001; Parker, 1974). More recently some authors have suggested that also certain behavioral traits, such as daring or boldness, should be considered a RHP trait (Rudin and Briffa, 2012).

Physical RHP traits can be either offensive or defensive. Offensive traits include body size and strength, and defensive traits include stamina and the ability to endure damage and attacks (Palaoro and Briffa, 2017). These traits form the individual's fighting ability, which often determines the outcome of contests (Hsu and Wolf, 2001; Palaoro and Briffa, 2017). In social species the outcome also depends on the group size. Group RHP depends primarily on the number of group members and the RHPs of individuals within each group (Batchelor et al., 2012), although in some cases presence of an individual with very high RHP (e.g., a mature male) can offset any advantage in numbers (Cooper, 1991). The traits that determine RHP in contests can be a complex combination depending on the environment and resources being fought over.

Accurate assessment of RHP, both one's own (absolute RHP) and in comparison to their

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opponent's (relative RHP), is a key factor in determining the outcome of contests. Many intraspecific contest displays and initial fighting are ritualized in order to assess the opponent's RHP and reduce injuries (Keeley and Grant, 1993; Parker, 1974). Prior visual assessment allows for assessment of size which can decrease contest duration, while initial fighting allows for assessment of strength and other traits (Keeley and Grant, 1993). If assessments of RHP are accurate it allows animals to avoid conflict, engage, or disengage from conflicts and therefore increase or limit the time and energy lost during contests as well as the potential for risk of injury (Arnott and Elwood, 2008; Parker, 1974). Variation occurs in individual's abilities to accurately assess RHP, and prior experience increase self-assessment of RHP, but does not necessarily affect fighting ability itself (Hsu and Wolf, 2001; Keeley and Grant, 1993). Many species have evolved behaviors or morphological traits that exaggerate the cues used for RHP assessment, such as displays of large teeth, horns, claws and other weapons, or ornamentation such as luxuriant hairs, feathers and fins. Such 'evolutionary cheating signals' are attempts to increase the apparent RHP, although such features are often good indications of an individual's fitness and absolute RHP (Parker, 1974).

Although RHP is a critical factor in determining the outcome of contests for a resource, empirical test have repeatedly demonstrated that individuals with higher RHP do not necessary always win a contest. Instead the outcome can also be influenced by other factors, including motivation (the subjective value individuals place on the resource), aggressiveness and ownership status (Allen et al., 2016; Arnott and Elwood, 2008; Batchelor et al., 2012; Parker, 1974). The initial owner of a resource is often more likely to win a contest, potentially due to either their experience or investment in the resource (Arnott and Elwood, 2008) or due to the benefits gained from the tenure of the resource itself (Parker, 1974). Rarity of a resource increases its value and therefore the motivation to obtain and investment in the resource, and also makes resource guarding more likely (Keeley and Grant, 1993; Parker, 1974).

Most studies to date have focused on intraspecific contests over resources. Although RHP in interspecific contests are understudied to date, they have the potential for increasing our understanding of RHP with future study. The ability to assess RHP varies by species (Arnott and Elwood, 2008), as does size, strength, and other morphological traits that determine RHP. As with intraspecific contests, size and stamina are likely critical to RHP and determining the winner of interspecific contests. Initial research shows that species-specific weapons are also important in these contests (Allen et al., 2016; Martin and Ghalambor, 2014), as well as social behavior since group-living species are clearly advantaged as greater numbers can outweigh body-size differences (Cooper, 1991). Species-specific traits create advantages and mismatches in RHP (Allen et al., 2016; Martin and Ghalambor, 2014), that make assessment important. Most interspecific bouts are over food and other resources, indirect sources of fitness that can hold less value than direct sources of fitness. However, interspecific contests also more often result in death of one or both of the contestants than in intraspecific contests, thus directly affecting fitness.

Cross-References

- ▶ Aggression
- ▶ Agonistic Behavior
- ▶ Competition
- ▶ Conflict
- ▶ Contest Competition
- ▶ Dominance
- ▶ Local Resource Competition
- ▶ Mate Guarding
- ▶ Motivation
- ▶ Resource Defense
- ▶ Resource Holding Potential

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