Order of Annotated Bibliography Entries:

The order of the annotated bibliographies is ordered based on the topics were displayed and certain factors dictating animal behaviours. The articles are chosen this way to explain background information, to the proximate and ultimate factors, to the extended literature, respectively.

Topic Summary:

 Foraging behaviour in penguins are peculiar in that they spend a major portion of their hunting time underwater in coastal regions, as explained by Ponganis et al (2000) and Mattern et al (2007). However, to undergo these hunting expeditions, penguins must take extended trips typically ranging a day long towards hunting ground (Mattern et al., 2007). Majority of foraging behaviour was observed using GPS loggers (Angelier et al., 2007), time-depth recorders (Cottin et al., 2014), as well as back-mounted video cameras [Crittercam] (Ponganis et al., 2000) to observe much of the foraging behaviours explored in various penguin species.

 Foraging behaviour of penguins was tracked and observed through quantitative means, such as diving duration and rate (Cottin et al., 2011), mass of chicks and female penguins during guarding stage (Crossin et al., 2012), and total time spent away from colony (Angelier et al., 2007). As a result, time spent on effective foraging was the focus of many of the studies on penguin foraging. Penguins can hunt in both benthic and pelagic waters (with some species being able to hunt in shallow waters; typically in more tropical areas), and their main diet consists of krill, fish, and squid - as shown by Mattern et al (2007) and Miller et al (2010), respectively.

 One of the biggest mechanisms in animal stress mediation is the hormone corticosterone (Crossin et al., 2012). Thus, the effects of how endocrinology played a role in this animal’s behaviour was focused on. Angelier et al. (2007) reviews several methods and results from previous corticosterone testing; penguins with elevated corticosterone were linked with shorter trips with increased foraging effort (thus increased foraging efficiency). Cottin et al., (2011), Crossin et al. (2012), and Cottin et al. (2014), produce more recent studies using implanted corticosterone pellets and/or patches to induce higher foraging effort. Crossin et al. (2012) went further and tried to understand if there was a correlation to elevated corticosterone and prolactin secretion (increased parental activity). Both Cottin et al. (2014) and Crossin et al. (2012) achieved greater maximum depth of foraging trips, as well as decreased duration of trips and time spent underwater; efficiency was deemed significant using multiple ANOVA and MANOVA models on all diving variables. However, both Cottin et al. (2014) and Crossin et al. (2012) achieved their foraging success by inducing corticosterone levels at the penguin’s average measured maximum (cross-referenced with control penguins). Cottin et al. (2011) produced less efficient penguins in comparison to the former two studies; penguins in this study had administrated corticosterone past natural limits. Therefore, a negative correlation with increased corticosterone was observed in this study. Through reviewing these 4 studies, a limiting factor in study material is the mechanisms in which energy is diverted from increased corticosterone.

 Penguin foraging base many of their behaviours on factors that have been adapted to them depending on the habitat they reside in. Green et al. (2005) observed that penguins have a general migration pattern depending on the season and annual conditions. Penguins often spent less time underwater during the winter, but had increased foraging effort during underwater periods. Whereas annual conditions with more sunlight (summer time), penguins spent more time underwater, but less time foraging, as shown by Green et al. (2005). Penguins are also conditions to forage when optimal light above water (bright enough to see under surface of water) is obtained (Ainley and Ballard 2012). Both these studies reference how annual migrations within polar latitudes are effectively factored in towards risk-adverse actions; better visibility means less likelihood of predation risk (if conditions are not optimal, greater effort is needed to produce foraging results). Lastly, penguins are shown to be highly adaptable among other penguin species, as Miller et al (2010) were able to determine different compositions of diets among both species inhabiting the same foraging area. Future research on all these articles can be done on how more tropical penguins are affected by migration patterns; less predation risk due to more optimal foraging conditions (better lighting, less predators/competition, and different diet composition).