


**Article:**
Wells, V.K. (2012) Foraging: an ecology model of consumer behaviour? Marketing Theory, 2 (12). pp. 117-136. ISSN 1741-301X

https://doi.org/10.1177/1470593112441562

# Foraging: an ecology model of consumer behavior?

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First Submission June 2010

Revision One December 2010

Revision Two August 2011

Accepted for Publication: September 2011

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I would like to thank Tony Ellson for his guidance and Gordon Foxall for his helpful comments during the development and writing of this paper. I would also like to thank Don Hantula for sparking my interest in foraging theory and consumption.

# Foraging: an ecology model of consumer behavior?

**Biography**

Victoria is senior lecturer in marketing at Durham Business School. Previously she was lecturer in marketing and strategy and research associate at Cardiff Business School as well as a research assistant and graduate teaching assistant at Keele University. She has also worked in industry as an Account Executive in marketing communications. Her research concentrates on consumer behaviour and consumer responses to marketing actions including behavioural psychology applications to consumer behaviour, the impact of the physical environment on consumers and consumer environmental behaviour. She has recently published in the Journal of Marketing Management and the Journal of Business Research.

# Foraging: an ecology model of consumer behavior?

**Abstract**

Foraging theory is a well-established set of models and ideas in ecology, anthropology and behavioral psychology. Two areas of research, the behavioral ecology of consumption and information foraging, have made strides in the application of foraging theories in relation to consumption and related behaviors. These focus on online situations and restrictions in methodology utilised allow application to only a small range of marketing problems. This paper broadens the application of these notions and introduces foraging ideas/terminology to a wider business and marketing audience by contextualising and comparing with current research in marketing and related areas. The paper makes a number of suggestions for use of the foraging model in both academic and practitioner based environments. The paper ends with discussion of future research on the assembly and wider application of a foraging ecology model of consumer behavior.

**Keywords:** Foraging, consumer behavior, store choice, brand choice, travel, social foraging

# Foraging: an ecology model of consumer behavior?

## Introduction

Behavioural ecology and foraging theory, provides a framework for answering questions about strategic feeding and consumption behavior of animals (Stephens and Krebs 1986), including behaviors such as search, identification, procurement, handling, utilisation and digestion (Mellgren and Brown 1987). It combines ideas from evolution, ecology and behaviour studies and has developed from a number of schools of thought (Krebs and Davies 1997). Foraging theory has traditionally been used to study the behavior of animals in naturalistic settings, via both quantitative and qualitative methodologies, and has been expanded to the operant experimental laboratory via behavioral psychology (termed behavioral ecology)(Williams and Fantino 1994). In the tradition of the natural sciences the study of animal foraging behaviour has involved a substantial research building precise quantitative predictions which have been tested and refined through extensive replication. Foraging theory has also been used to analyse both ancient and modern hunter-gatherer populations in anthropological settings exploring human foraging behavior via observation (Fitzhugh and Habu 2003, Kelly 1995, Winterhalder and Smith 1981, Smith and Winterhalder 1981, Winterhalder 1981) and more recently modern aspects of human behaviour such as the behavior of serial killers by comparison to bees behaviour (Carpenter 2008, Raine, Rossmo and le Comber 2009).

Evolutionary psychology is of central importance to foraging theory, especially the development of behaviour through a slow incremental process of variation, selection and improvement (Colarelli and Dettmann 2003). The use of evolutionary bases to investigate the

consumption behaviour of human consumers has gained attention over the last 10 years exploring behaviours including gendered consumption, beauty products/procedures, unethical behaviour, sexual activities, risky and conspicuous consumption, advertising responses, toy choices (Saad and Gill 2000, Saad, 2006, Saad 2007) gift giving (Saad and Gill 2003), sun tanning (Saad and Peng 2006), voting behaviour (Saad 2003), reinforcement (Nicholson and Xiao 2010) and more general marketing practice in line with food and marketing preferences (Colarelli and Dettmann 2003).

Rajala and Hantula (2000) introduced the idea of foraging as a possible model of consumer behavior, introducing initial suggestions as to the relevance of foraging as well as a specific model: Behavioral Ecology of Consumption (BEC) (Rajala and Hantula 2000, Hantula, DiClemente and Rajala 2001, DiClemente and Hantula 2003a, 2003b). BEC applies mathematical models of optimal foraging theory (Stephens and Krebs 1986) to human consumption through operant experimentation and is described as a synthesis of Darwinian theory, foraging theory and delay discounting (Hantula, DiClemente Brockman and Smith 2008) building on the synergistic coupling between behavior analysis and behavioral ecology (Fantino 1985). The BEC provides a different approach from Winterhalder and colleagues (who utilised an observational (quantitative and qualitative approach)) through its use of an operant perspective and experimental approach. The BEC has highlighted the potential of foraging in marketing applying a number of foraging theories including the Delay Reduction Hypotheses (DRH) and Changeover Delay (COD) to consumer online purchasing of CDs and the Marginal Value Theorem to capital investing behaviour. Hantula and colleagues manipulated delay in store, temporal issues and in-stock probability to assess the time allocation of consumers and their switching behaviour within a simulated internet mall. Their research showed that

consumers were sensitive to the programmed delays and that hyperbolic discount functions provide the best fit to the data. These quantitative conclusions are very similar to the work of researchers exploring animal foraging. Overall the BEC has supported and developed a number of aspects of foraging within consumption and remains a vital and interesting approach.

However the BEC is not the only operant interpretation of consumer behaviour drawing on foraging theory. It is generally agreed that the first application of behavioural psychology to consumer behaviour was by J.B.Watson through his work at the J.Walter Thompson advertising agency (DiClemente and Hantula 2003b). Nord and Peter (1980, 1982) considered a behaviour analytic perspective on marketing exploring the wider issue of reinforcement. Foxall and colleagues have also developed consumer behaviour analysis research (CBA) applying operant (via the behavioural perspective model) and behavioural economic (via matching- the tendency of animals and humans to distribute their responses between two choices in proportion to the patterns of reward received from each choice) principles to consumer choice patterns in fast moving consumer goods (Foxall 2001, 2003, Hantula and Wells 2010). Operant methods have been extremely useful in assessing and exploring a wide range of consumer behaviours including brand choice (Foxall, Oliveira-Castro, James and Schrezenmaier 2007), substitutes and complements (Foxall 1999, Romero, Foxall, Schrezenmaier, Oliveira-Castro and James 2006, Foxall, Wells, Chang and Oliveira-Castro 2010), price (Oliveira-Castro, Foxall and Schrezenmaier 2005) and online behaviour (Fagerstrøm 2010). Foxall's work on matching states that consumers take part in patch sampling where consumers do not remain loyal to one brand/store but sample other brands/stores and rarely abandon a brand/store but practice multiband purchasing. This supports the patterns exposed by Ehrenberg (1989) and helps to explain consumer's outwardly unexpected behaviour.

Another area of exploration is information foraging (Pirolli 2005, Pirolli and Card 1999) which analyses information search and utilization behavior and developed in parallel to the work of Hantula. Pirolli suggests the importance of information scents to determine online links to follow and length spent on a particular website. Using both qualitative studies (e.g. studying a professional technology analyst and teams of MBA students (Pirolli and Card 1999)) as well as using extensive mathematical modelling (Pirolli 2005) Pirolli and colleagues have attempted to determine the behavior of 'infomavores'- those organisms hungry for information about the world and themselves (Pirolli 2003). Information is an important part of consumers purchasing behaviour both as a product and also as a means to make decisions. It is certain that 'informavores' are within the purchasing world, especially as online purchasing and the purchase of high technology products and extensive pre-purchase search is more commonplace.

Both the study of information foraging and the work of Foxall are excellent examples of triangulation/mixed methods (Johnson, Onwuegbuzie and Turner 2007) allowing a deeper understanding of the issue to emerge. The work of both Foxall and BEC, as is the tradition of foraging, has sought to replicate findings. Replication refines theory development and is a significant step for knowledge advancement (Easly, Madden, and Dunn 2000; Evanschitzky, Baumgarth, Hubbard and Armstrong, 2007).

To aid comparison Table 1 summarises the main empirical studies at the foraging consumption intersection. Only those studies which explicitly state foraging as the focus of attention are included and hence a range of studies are not included.

" Table 1 about here"

While the BEC and information foraging have established a base for a foraging analogy of consumption their focus has been, by choice and determined by their discipline, narrow. Their

successful approaches allow for a wider ranging, holistic and integrative approach to a marketing/consumption foraging ecology. Rajala and Hantula (2000) and Foxall and James (2003) make a wider range of proposals for ecological aspects that could be applied to marketing but a full assessment of this potential has not yet been made. Foraging has yet to be assessed alongside current marketing, strategy and consumer research in multiple areas and levels of consumption (for example pre-purchase, search, action and post consumption) and has not been fully and systematically assessed as a useful and realistic approach to many areas of consumer behavior. To aid marketers foraging terminology and theories will need also to be described in marketing terms.

Therefore the objectives of this paper are to review research at the consumption foraging intersection and to introduce foraging terminology and theories to a wider audience including less researched aspects of foraging such as social foraging.

**Foraging Decisions**

Winterhalder (1981) divides foraging into four decision sets: optimal diet breadth; optimal foraging space; optimal feeding period and optimal foraging group size. These categories allow questions about (1) which items the forager will consume; (2) where in space the forager will seek food resources (3) times when foraging will occur and (4) the circumstances in which foragers will form groups. These categorisations will form the structure of the paper as these questions are as relevant for human consumption as for animals. In marketing terminology the questions determine; (1) brand and product choice; (2) retail choice; (3) temporal issues and (4)

social issues. Rashotte, O'Connell and Djuric (1987) separate foraging into two main choices- 'within' and 'between' patch choices. The suggestion is that patch choice would equate to brand/product choice (in-store choices) while between patch choices would translate to retail choice (between store choices) (James 2002). Figure One makes this comparison. Between patch decisions, relate to search, evaluation and decision/purchase. Within patch decisions relate to decision/purchase, consumption and post-purchase behavior. Social and temporal issues have an effect on both between and within patch decisions and so are represented across the range of decisions. Handling can also take place at all times and is also represented across the range of decisions although it is most likely to happen at the point of decision/purchase when for example consumers will try on a dress or test the firmness of fruit. Post consumption behaviour (for example: disposal (Harrell & McConocha 1992), complaining (Boote 1998), information sharing and product evaluation (Gardial, Clemons, Woodruff, Schumann and Burns 1994)) are also included in the figure as are post foraging behaviours (for example: movement and distance away from the patch (Hoppes 1987), perch type, seed dispersal (Chavez-Ramirez and Slack 1994) which completes the full consumption experience.

"Figure 1 about here"

There is extensive support for traditional theories and models in consumption, but few can comment on the whole of the consumption experience and encapsulate multiple levels of analysis. In textbooks, some authors outline the process and pay some attention to the linked nature of it, but this restricts itself to exploration and teaching at a low level. Deeper theoretical explorations have instead recently chosen to concentrate specifically and understandably, on specific areas with multiple theories/studies available to consider any particular part of the consumption experience. This is changing (Hui, Bradlow and Fader 2009) but not commonplace

and some researchers are looking holistically at the whole shopping experience. A foraging ecology of consumption, as seen in Figure One, provides the vehicle for a more holistic approach to the consumption experience using two overriding aspects (between and within patch choices) and two secondary aspects (social and temporal issues).

As noted the remainder of the paper will firstly follow the Winterhalder (1981) classifications looking at product choice and retail choice, then going on to discuss temporal issues and social issues. The paper will end with a discussion of future research directions and conclusions.

**Brand & Product Choice: What will the forager consume?**

Consumption is the main 'within' patch decision and includes many of the component stages of foraging choices introduced earlier. Handling (Hantula, DiClemente Brockman and Smith 2008: 147) 'denotes time and energy devoted to a prey item after it has already been acquired or captured and before any energy can be derived from it'. While handling may not be a major stage within consumption behaviour it is an important one, microwave meals still need to be cooked, furniture may need to be assembled and packaging removed. In studying delay Hantula et al (2008) describe handling as the conceptual centrepiece of consumer decision-making. Each stage is important but time spent on each may differ depending on the purchase at hand. Rosati, Stevens and Hauser (2006) found in their study on discounting, that animals do not treat all temporal components of the decision-making process as equally relevant. Consumers may search extensively for a product that is risky or expensive. Recreational shoppers may search extensively (window-shop), clothes shoppers may handle the product (try it on) but never or

rarely buy. Rosati et al (2006) note that handling time is important in prey selection with the amount of handling time being a key indicator in consumption decisions, with preferences adjusting to account for handling time especially when there are long delays. For example a consumer may prefer a piece of furniture with is already assembled and available immediately rather than one which is out of stock, especially if this delay is substantial.

In human consumption the prey could be considered the product, brand or service (Hantula et al 2001). Foraging theory is based on the principle and goal of optimality (cost against benefit) described by Charnov (1976) as a point of view rather than a strict theory. DiClemente and Hantula (2003a) present Stephen and Krebs (1986) three components of optimal foraging models: decision assumptions, currency assumptions and constraint assumptions. The first of these relates to which prey to choose and when to leave a patch and are dealt with elsewhere. The second component is currency. Within ecology the simplest and most common form of currency is the energy gained per unit time spent foraging (E/T) where energy can be a cost (energy expenditure) or a benefit (energy gained). However currencies are as diverse as the adaptations they are used to study (Stephens and Krebs 1986, Hantula In Prep) and include food, nesting materials, play materials or access to a mate. Within this there are both outcomes/benefits (energy) a well as inputs/costs (time) which together determine the currency (Stephens and Krebs 1986, Shettleworth 1988). Any foraging model must begin by formal specification of the currency to be maximised (Winterhalder 1981, DiClemente and Hantula 2003) and although energy may be of some importance to human consumers, for the majority of consumption decisions, it is unlikely to be central and like foraging animals there are a wider range of currencies that can be used. The consumer behavior literature is full of potential currencies (both positive and negative) and determinant attributes which could be utilized and can be segmented

into both outcomes and inputs. Outcomes might include pleasure (Staddon 1980), experiential/hedonic aspects (Hirschman and Holbrook 1982), utilitarian or informational reinforcement (Foxall 1990), status of the product (Chao and Schor 1998, Eastman, Goldsmith and Flynn 1999) and sensation seeking (Zuckerman, Eysenck and Eysenck 1978) amongst others. Inputs might include effort (Dall, Cuthill, Cook and Morphet 1997), monetary expenditure (Hantula 2010) and sacrifice of time (Hantula 2010), which could be weighted with the outcomes by the consumer (Desrochers and Nelson 2006). As is the nature of much social science debate no single currency has yet, or is likely to be determined as the best or most useful either as an outcome or an input making determination of a single currency almost impossible. Some sort of multiple currency, or balance between particular outcomes and inputs may provide a more appropriate means of approaching this problem.

The third component, constraints, refer to factors that limit and define the relationship between currency and the decision. Within ecology constraints include the animals' ability and tolerance (DiClemente and Hantula 2003a), the amount of time which can be spent foraging or capacity to digest foods (Kelly 1995), knowledge of resource distribution and perceptual constraints (Tregenza 1995). There are also constraints within consumers' behaviour including time (Hantula 2010), monetary expenditure (Hantula 2010, Foxall and James 2003) and budgets (Rhee and Bell 2002).

Two separate themes of 'within' patch decision models have developed from the optimality approach, the classic prey selection models and the optimal diet model. Both approaches are similar and concern what a forager will do when it encounters items of different types and the range and variety of items that are harvested in different environmental circumstances. These models make a number of assumptions (Shettleworth 1988) based on the idea that prey types

differ in their profitability: (1) the predator is assumed to be able to recognise prey types perfectly and instantaneously (Hughes 1979); (2) prey is included in the diet in the order of their profitability; (3) acceptance of a prey type depends not on its own abundance but on the abundance of higher-ranked types of prey (Pulliam 1974) and finally (4) choice is all or nothing (a prey type should either always or never be attacked when encountered). The first assumption suggests a perfect knowledge, which is unlikely, but through suggested signal detection theory (Raschotte, O'Connell and Djuric 1987) the foraging situation might be more realistic. Signal detection theory suggests 'in some foraging situations, predators learn that certain types of feeding opportunities are signalled by the occurrence of environmental events' (Raschotte, O'Connell and Dyuric 1987:153). The signal could be a light/noise (in the Pavlovian sense) or a discriminative stimulus (in the operant sense). In consumption terms a consumer's reliance on brand names/marks could act as signal that the consumer will rely on rather than having perfect knowledge of every brand.

The second assumption relates to prey being consumed in order of their profitability. Consumers are likely to compare products based on their relative value (e.g. price vs. quality) and they will likely purchase products with most value first, taking into account any constraints. However consumers often demonstrate inconsistent choices and Shettleworth (1988) suggests that partial preferences, rather than optimality may in fact be the norm. Two main reasons for this are put forward: misidentification of prey and sampling. The first suggests that there is the aim of optimality but perhaps due to a lack of knowledge or experience, incorrect choices are normal (in the consumption sense, incorrect purchases where an incorrect purchase is defined as one that does not agree with the currency under which the consumer is operating). Sampling results in foragers trying less preferred prey because they could be potentially profitable. Long

term optimality is the aim but in the short term this optimality may be sacrificed and sampling may 'fine tune' preferences.

The third assumption that acceptance depends not on its abundance but on the abundance of other prey types concerns itself with the acceptance of food types and suggests that where there is a decrease in all food densities the less favourable food will become progressively more acceptable (Lea 1982). Food and other consumable goods are densely available via modern retailing practices and for most consumers products what they want and need are easy to find and it is unlikely that consumers would (apart from due to other constraints) have to move to less acceptable food types. However, in other forms of consumption where the prey (product /brand) may be less available this type of behavior may be observable. An animal cannot forage when there is no prey and similarly a consumer cannot consume an unavailable product. Consumers whose preferred products are not available will not be able to buy the product they most value and are likely to move to the product they value next. Moermond, Denslow, Levey and Santana (1987:230) describe availability as 'the relative abundance of potential food items……..made up of relative detectabilties (i.e. proportion of each item usually encountered) and relative exploitabilities (e.g. ease of capture)'. Retailers try to ensure abundance, but some products may not be available in certain seasons (fruit/vegetables) and some consumers may not always encounter products due to where they live and the shops available (Skerratt 1999) or their unwillingness consume within a particular store. The idea that a change of patches will allow predators to encounter a different range of prey has close parallels (Moermond, Denslow, Levey and Santana 1987) and simply a change in the normal supermarket chosen will result in encounters with different products and brands. The acceptance of something new, different or rarely purchased could even result in long term improved profitability. Food availability and its

effects on product choice are of interest in public health and nutrition literatures. Comparisons between the availability of nutritional versus non-nutritional foods have shown that food availability has improved throughout the UK, with the increased availability of snack foods being blamed for a lack of interest in more nutritional foods (Barratt 1997, Pettinger, Holdsworth and Gerber 2007). This behavior could certainly fit with a foraging model that suggests prey are consumed in order of their profitability and may help determination of the consumers' currency and/or priorities in this situation.

The final assumption is that acceptance is all or nothing. In terms of human consumption we don't have to buy a product just because we see it. Even if it is a product we prefer if we have just purchased it or have some stored at home we are not likely to purchase it.

**Retail Choice: Where will the forager consume?**

Patches are physical areas within a habitat, often well defined, in which an animal can find prey. The obvious analogue for human consumers would be physical area such as a shop or a mall (Hantula et al 2001). The patch however, does not have to apply to definite physical boundaries and might instead form the acceptable shopping area or the shops the consumer is aware of. For example, Finn and Louviere (1990) suggest a consideration set of those retail alternatives a consumer is aware of and evaluates positively. Winterhalder (1981) suggests an optimal foraging space that may encompass a range of differing patches of different qualities.

The decision to remain and forage or leave a patch or store is an important issue (Roche, Stubbs and Glanz 1996) as is the decision to return to a patch or store after a period of time. However, current consumer research concentrates on reasons to choose the retail environment

initially, incorporating for example, location (Huff 1964, Cummins and Macintyre 1999**,** Rhee and Bell 2002), household income, family size (Rhee and Bell 2002) and centre attractiveness (Fotheringham 1988) rather than why to remain in or return to the patch. However, unlike the more fragmented brand choice literature some retail literature has attempted to bring together the multiple reasons for retail choice into one model. Bloch, Ridgway and Dawson (1994) suggest six factors that motivate consumer presence in malls; aesthetics, escape, exploration, flow, epistemic gains and social/affiliation benefits. Similarly Pan and Zinkham (2006) suggest three broad antecedents of retail patronage: product-relevant factors (quality, price, assortment), market-relevant factors (convenience, service quality, store image) and personal factors (demographics, store-type attitude). While these factors are useful in determining the initial reason to choose a store they can also be useful determining factors in consumers likelihood to purchase or return to a store, which fits with the broader view of the foraging literature.

Both animal and human foragers may choose to visit one patch (if this provides all they need) especially when the distances between patches are great or the patch is large enough to sustain them but animals will also forage in multiple patches (for example this could be different parts of a woodland or different woodlands in a period of time) as humans will shop in multiple shops, even on one shopping trip. Although much shopping can be done 'under-one-roof' (Pettinger, Holdsworth and Gerber 2007), Brooks, Kaufmann and Lichtenstein (2008) suggest that single shop models are unrealistic and seek to probe more complex, multiple shop, behaviors. They propose that trip chaining is common with between 40%-74% of shopping trips being multiple stop trips depending on the type of purchase.

This type of multiple shopping trip behaviour (either on- or off-line (Lee and Tan 2003)) can be explored using foraging work exploring patch quality and assessment and also the reasons for

and patterns of switching/sampling between patches. Patches provide levels of quality (taking into account the prey available) and if a patch were never to change in quality foragers would remain in the patch and forage or return to it repeatedly. However this type of stability is rare and many theories in this area include problems of changing quality and depletion (Roche, Stubbs and Glanz 1996). Patch assessment has received considerable attention, and as with prey models, there has traditionally been an assumption of complete knowledge but now replaced by more sophisticated models. Foragers generally move towards efficient patch use and a requirement of knowledge and information use is often implied.

Sampling of alternatives and switching between patches is one way in which foragers collect knowledge and experience and will therefore allow a patch choice based on reasonable understanding of what each patch offers and its relative quality. Memory will play a role here storing information about places visited and the results of those visits (Olton 1982). Rhee and Bell (2002) describe this store-specific knowledge as a benefit and suggest that consumers will be unwilling to move stores if they loose this knowledge or have to gain new knowledge.

The most popular sampling and switching models are the Marginal Value Theory and giving up times theories (GUTs). Marginal Value Theory (Charnov 1976) suggests that 'the forager should stay until its rate intake in the patch falls to the average rate for the environment….' (Shettleworth 1988:17). This suggests that if the forager detects a patch of equal quality to the one in which it is foraging they should move to it, if only to sample. Consumers will switch to another store when the perceived benefits of doing so outweigh the costs and may explain the multiple stop trips. Travel time, and the effort involved will also moderate the effect of patch quality. Studies advocate that when there is a longer travel time between patches the forager will remain for longer in their present patch demonstrating a more persistent approach (Roberts 1993,

Kamil, Peters and Linstrom 1982, Elliffe, Jones and Davison 1999). Similarly, if a consumer was to experience an out of stock situation whilst supermarket shopping then the potential travel time to another supermarket may be considerable and require car travel or public transport that may influence any decision to switch. However where more specialist products are available in limited stores consumers may be willing to make the extra effort overcoming the potential travel time. This balance between distance and benefits has received some attention in the literature although is not fully developed. Rhee and Bell (2002) discuss the relative inconvenience of larger distances against the accumulation of other benefits such as low prices or preferred assortments. Both the work of Hantula and Foxall can also be related to switching. Hantula's work suggests consumers will move and sample other patches to reduce delay to reinforcement while Foxall, utilising a matching analysis, suggests that consumers would use multiple patches/prey but in relation to the comparative reinforcement offered by each alternative. In comparison GUT theory presents the idea that a forager should leave a fixed time after the most recent prey capture or in consumption there would be a fixed time before a consumer would give up or try elsewhere. No consumer based literature suggests what these timings might be, their stability or relevance.

**Temporal Issues: When will foraging occur?**

Many of the temporal issues relevant to a foraging theory of consumer behaviour have at least been touched on in other parts of the paper. Consumption behaviour like foraging behaviour is distributed across time, consumers have a limited amount of time and therefore foraging like

consumption is a temporal issue. Hui, Bradlow and Fader (2009) suggest that consumers enter a shop with a shopping time budget and time pressure to complete tasks will become greater as time reduces resulting in differing strategies at different times. Underhill (2000) highlights a number of time relevant aspects of shopping such as the importance of waiting time, browsing time and increasing time pressure. There are a number of different foraging models that cover specific temporal issues, for example, the delay reduction hypothesis (DRH)(Fantino and Abarca 1985) studied by BEC (Rajala and Hantula 2000). While there may be similarities between the timing issues animals encounter and those of human consumers Kelly (1995) suggests that human hunters often pursue game for a longer time than do non-human predators and that techniques used by human hunters require longer pursuit times. Underhill (2000) also shows how social issues can affect how long consumers choose to shop for. Women with a female companion or with children shopping for significantly longer if they are alone or accompanied by a man.

**Forming Groups: Social Issues of Foraging?**

Two streams of foraging research have examined the social aspects of foraging: Ideal Free Distribution (IFD) and social foraging.

IFD theory (Fretwell and Lucas 1970) is concerned with the distribution of individuals across a habitat and considers that the suitability of any area of the environment will be a function of the density of competitors occurring there (Tregenza 1995). That is, the suitability of the patch will decrease with an increase in the density of individuals there. As the number of foragers increases

each individual gains a smaller proportion of the number of resources such that the forager will do better to move to a different patch. IFD theory has been applied to human group behaviour showing an approximation to the IFD (Kraft and Baum 2001, Madden, Peden and Yamaguchi 2002) although not in the consumption area.

These central ideas of IFD are directly related to crowding research (Harrell and Hurt 1976) where crowding influences the consumers' confidence, confuses and lowers the consumers' mood and is related to poor layout and retail design (Dotson and Dave 2008). While some research suggests that crowding or the resulting crushing that comes from it (Underhill 2000) will result in the consumer shortening the shopping trip (and leaving the patch) there is little comparable research to suggest whether the consumer would then move to a less crowded patch and how this will affect their shopping success overall.

The name 'ideal free' comes from the idea that organisms are assumed to be ideal in their judgement of the profitability/suitability of each of the sites and the organisms are assumed to be free to move between sites (Sutherland 1983). Other assumptions made within IFD theory are that foragers will act to maximise foraging efficiency, have perfect knowledge and are of equal competitive ability (Kennedy and Gray 1993). A number of the assumptions within IFD theory have been tested, considered and altered or removed by advances in the theory (Tregenza 1995).

There has been consideration of whether all individuals are of equal competitive ability which is a frequently violated assumption within IFD. Studies have shown that better competitors are over represented in the better sites, while poorer competitors are over represented in the poorer sites (Kennedy and Gray 1993). But who are better consumers? Are better consumers those who are more satisfied with their purchases or those who get more value for money? Once this is decided this assumption could be tested. The perfect knowledge assumption has also been

violated many times with a perceptual constraint on an organism's abilities to detect differences between sites (Kennedy and Gray 1993). It is unlikely that consumers would have total knowledge of either patches or prey and it is likely that in human consumption that this assumption would also be violated. James (2002) shows that while consumers have generally accurate knowledge of brands and prices this is generally restricted to those which they buy often. Whether this knowledge extends beyond the familiar is debatable.

One major alteration to the IFD theory is the addition of competition influence. This has included discussion of interference, at its lowest level simply interactions that reduce search efficiency, to the extreme of kleptoparasitism (outright expropriation of food from its finder)(Sutherland 1983, Kennedy and Gary 1993, Tregenza 1994, 1995, Moody and Houston 1995). Again this may be related to crowding (being unable to get to a product or patch) or may also be related to shopping with others. At the extreme end of the spectrum aspects of consumer misbehaviour may also affect ability to consume. For example Lovelock's (1994) Jaycustomers who include Family Feuders, who argue with their own family or staff and the Thief who steals goods and services and will affect the availability of goods and services and also make the retail environment less pleasant for other consumers.

The second area which has received attention has been social foraging. The criterion for social foraging is that two or more individuals concurrently influence each other's energetic gains and losses and there are identifiable, mutual relationships. Mutual dependence results from an individual's payoffs and penalties whether this is during the search for food or during the division of food following its discovery. Giraldeau and Caraco (2000)(see also Vickery, Giraldeau, Templeton, Kramer and Chapman 1991, Giraldeau, Caraco and Valone 1994) provide the most extensive overview of research in social foraging and their work concentrates on game

theory modelling rather than empirical work. These include the study of producers and scroungers (Barnard and Silby 1981, Beauchamp 2000) and information sharing models and their effects on individual intake. Giraldeau and Caraco (2000) also make the distinction between aggregation and the social group. Aggregation would be a group of people who happen to go shopping at the same time but do not know each other and a social group would be those who choose to shop together. Consumers who choose to shop together, whether due to family ties or friendship are likely to affect both the product (prey) and retail (choices) as well as the currency of the shopping trip. For example, a consumer may value the more hedonistic and recreational aspects of shopping and may therefore choose to forage socially as they know that this will increase the fun aspects of shopping. The suggestion is that social foraging can increase foraging efficiency and enhance learning capacities. The application to consumption may be that consumers will forage for different types of products and share information (for example about a new brand/shop) or the products themselves. The resultant significant search time and effort savings may make new patches/preys easier to identify, discover and sample.

Giraldeau and Caraco (2000) also note group size and the benefits/disadvantages of exploitation of particular resources as individuals and as a group which are areas relevant for study within consumer and retail disciplines. For example, foraging theory can address questions relating to ideal group size for shopping and what specific benefits/limitations arise from shopping as a group compared to an individual (the issue of cooperative hunting maybe useful here (Packer, Scheel and Pusey 1988)). Figure One highlights that social aspects of foraging are prevalent throughout all stages in the consumer decision making process and will affect what and where a forager will consume. However overall Giraldeau and Caraco suggest that social

foraging theory, due to the lack of research in the area, lacks unifying themes and clear recognition of the problems.

While IFD and social foraging form the core of social foraging research other areas have received attention and may be useful in terms of human consumption behaviour. Social learning has been used to question how organisms learn from one another (Beauchamp 2000) and learn and share both public and private information (Valone 1989, Leadbeater, Raine and Chittka 2006) and how this affects their choices. Individual consumers share information and the behaviour of information sharing foragers could be compared to, for example, the behaviour of opinion leaders (Shoham and Ruvio 2008) and market mavens (Feick and Price 1987). Another potentially useful viewpoint in foraging success may be social status (Gurven and von Rueden, 2006). Consumers are well known to purchase products via conspicuous consumption but how far does this affect their success in consumption.

While the group and social aspects of foraging have received attention this is not in the magnitude of other areas of foraging research largely due to the limited applicability in animal foraging situations and the problems of studying social behavior in archaeological ecology. However in terms of advanced human consumption, social foraging is likely to be important as an explanatory variable.

**Future Directions**

This paper proposes a conceptual model of a foraging ecology of consumption but future work is now necessary to ascertain and cement the usefulness of the model with a number of features

requiring further discussion. Currency or determinant variables are of importance in foraging both at the prey and patch levels and are perhaps the area that needs the most detailed analysis.

Any forging model of consumer behavior needs to determine if it is in itself suitable for all consumption or is perhaps more suited to specific types (for example, BEC concentrates on online buying situations). Foraging in its ecological form is about the life and death choices. If animals do not forage and successfully find and capture prey they will not survive. In some situations consumption for humans is life and death, for example where food or other resources are scare or consumers have a low income (Ekström and Hjort 2009). Consumers may also feel pressurised in certain situations such as sale shopping where there may be a lack of resources, greater competition and greater pressure to get value from purchases. In other consumption situations, for many consumers in westernised societies, shopping is far from a life or death situation and the consumer is not under as much pressure to buy. The theories of complex/ affluent foragers (Koyama and Uchiyama 2002), where foraging is not just about survival may prove a valuable viewpoint on day to day consumption situations. The environments in which affluent foragers exist are described as productive rather than harsh and provide a richer suite of natural resources, hence the foragers are more sedentary and a higher level of economic complexity is seen (Koyama and Uchiyama 2002).

Related to different levels of affluence a range of other factors could affect the predictions of a foraging model of consumption and require further exploration including demographics, geographic and individual factors. The age and gender of a consumer will affect how they shop and the products they choose (Underhill 2000). Whether a consumer can be categorised as a recreational or economic consumer (Bellenger, Robertson and Greenberg 1977, Williams, Slama and Rogers 1985, Bloch, Ridgway and Dawson 1994, Underhill 2000) would for example affect

their choices significantly. Whether the consumer is a variety seeker or a large or small basket consumer as well as their learning history will have distinct affects on their behavior. As Kelly (1995) suggests, generalisation is important but an understanding of the underlying variability should be studied and not masked.

Primary data collection is necessary to further facilitate a foraging model of consumer behavior. Both the BEC and information foraging have chosen to use experiments to study the behaviour of consumers. While there has been some tension about the realism (Hantula and Bryant 2005) and relevance of laboratory work (Fantino and Preston 1988, Rajala and Hantula 2000) the experimentations do reflect many aspects of the online world consumers are regularly engaged in. The experiments use the same equipment and interfaces to perform the same tasks that consumers do anyway (Hantula 2005). They have impact and evoke valid psychological responses, and therefore have experimental realism (Furnham 1997) and to a certain extent demonstrate mundane realism through the aspects of similarity with the real world (McDermott 2002, Rosnow and Rosenthal 2005) and have internal validity. However the simplification in experimentation (for example in the BEC fewer retailers and no budgets) reduces the external validity of findings (Fantino 1985, Fantino and Preston 1988). Both internal and external validity have importance in any research programme and Hantula (2008) and Hantula and Schoenfelder (in press) agree that there is a need to extend the generality of the findings beyond the laboratory setting. Foxall and James (2003) is the only work to begin this process, by exploring a wider range of consumption stages and aspects using an interview methodology outside of the laboratory, although only as part of a study exploring the applicability of matching to consumer choice. Fantino (1985) suggests the results of laboratory research gain external

validity if they take into account outcomes and factors that appear through field research. This paper therefore suggests a need for more field research.

It may be the case that more qualitative and a more observational approach, as well as further conceptual development is necessary to form the basis for more quantitative work. Bloch at al (1994) suggest that there appears to be significant opportunities to investigate the mall habitat using qualitative or phenomenological approaches such as observation, videography and in depth interviewing. Desrochers and Nelson (2006) propose that much relevant behavior is impossible to discover even by scanner data and a more depth approach is required. Hui, Bradlow and Fader (2009) suggest combining shopping path data with surveys collected before or after the shopping trip and asking consumers to state their goals etc. All of the above could assist the development of a foraging model of consumption.

**Conclusion**

This paper has discussed a potential foraging ecology of consumption and compares themes and theories in both foraging and traditional consumption. The foraging ecology model is especially useful because of its simplicity. Both between and within patch decisions base themselves on currency/determinant variables and all models and theories within foraging work result from the assumption that maximising currency is the reason for consumption. This allows researchers to discuss both retail and brand choices of consumers in the same terminology allowing for easier discussion and further comparison between these two central aspects.

The BEC and information foraging have taken great strides in developing understanding of specific online applications of foraging but the potential of a foraging ecology of consumption as discussed in this paper goes much further. This paper introduces the topic to a wider audience as a call for further research with particular emphasis on a more integrated approach.

If foraging can explain, or at the least help to understand the behavior of consumers in natural settings and across the whole of their consumption experience, an ecology model of consumer choice could highlight managerial and practitioner implications for marketers and retailers (both on and offline) as well as suppliers, retailer designers, city and regional planners and architects. Hui, Bradlow and Fader (2009) claim that their research is the first to develop fully all aspects (the exhaustive, sequential and interrelated decisions of visit, shop and buy) of a grocery shopping path but a behavioral ecology of consumption would provide an alternative view, an arguably simpler and more interlinked appreciation of the full shopping trip, beyond grocery shopping to all consumption decisions, through choice of location to shop and brand choice, to post purchase behaviour. The topic also offers the possibility of a rich partnership between scholars and practising managers to achieve resonance between practice, research and theory.

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Table 1: Summary of empirical studies at the consumption foraging intersection (in chronological order)

| Study author(s) and year | Foraging area | Consumption area | Main Methodology | Conclusions | Fit Statistics/Indices |
|---|---|---|---|---|---|
| Pirolli and Card (1999) (see also Pirolli 2005) | Patch selection and use, Identification of useful prey/patches | Does not look directly at consumption but included because information search is an important and relevant part of human consumption behaviour. Human information technology usage Information collection within an office environment Online information collection by MBA students. | Qualitative: interviews, observation Quantitative: mathematical analysis of use of a commercial online bibliographic system. | Pirolli and card, through a number of individual studies show evidence for the application of food foraging models (for example, widely foraging predators vs. sit-and-wait foragers, time minimization etc) to information search and selection behaviour. | n/a |
| Rajala and Hantula (2000) | Delay Reduction Hypothesis (DRH), Changeover delay (COD). | Online purchasing of CDs- delay in store and in-stock probability. | Quantitative: Experimental analysis in a simulated internet mall. Two Phases (Phase 2 with a COD) | Some consumer's behaviour is sensitive to the programmed delays. Hyperbolic discount functions provided the best fit to the data. | Phase 2 results: $R^2$ 0.41 For four subjects who showed sensitivity to the delays (Phase 2): $R^2$ 0.91 |
| DiClemente and Hantula (2003) (replication and extension of Rajala and Hantula 2000) | Delay Reduction Hypothesis (DRH), Changeover | Online purchasing of CDs- delay in store and in-stock probability. Temporal Issues- | Quantitative: Experimental analysis in a simulated internet mall. | Participants were more sensitive to the delays in the various stores in the cybermall when an ascending clock was present | Time in Store/Hyperbolic function: No-Clock Participants Group $R^2$ 0.87 |

| | | | | | |
|---|---|---|---|---|---|
| | delay (COD). | the influence of a visible clock. | | on the screen. This affected their entries into the store, their purchases in store and time spent in the store. Fit statistics are shown only for purchases in store. Hyperbolic discount functions provided the best fit to the data. | Ascending-Clock Participants Group $R^2$ 0.94 Descending-Clock Participants Group $R^2$ 0.94 Full detailed results are available in the paper. |
| Smith and Hantula (2003) | Delay Reduction Hypothesis (DRH), Changeover delay (COD). | Online purchasing of CDs- delay in store and in-stock probability. Price. Store preference. | Quantitative: Experimental analysis in a simulated internet mall. | Participants established relatively consistent shopping preferences between stores. Data supported the primary hypotheses that price increases affect consumer preferences analogously to increases in delay to conditioned reinforcement, as predicted by the DRH. Hyperbolic discount functions provided the best fit to the data. | Group Purchase Data: $R^2$ 0.895 Hyperbolic<br><br>Individual Purchase Data: (1) $R^2$ 0.880 Hyperbolic , (2) $R^2$ 0.956 Hyperbolic, (3) $R^2$ 0.880 Hyperbolic, (4) $R^2$ 0.518 Hyperbolic, (5) $R^2$ 0.823 Hyperbolic, (6) $R^2$ 0.933 Hyperbolic, (7) $R^2$ 0.826 Hyperbolic |
| Foxall and James (2003) | Patch choice, assessment and usage, travel time | Brand choice. Impact of price and travel time | Quantitative: via matching analyses of consumer choice Qualitative: Interviews | Consumer behaviour for fast-moving consumer goods (fmcgs) exhibits matching, but in the form of multi-brand purchasing rather than exclusive choice. Foraging is a useful explanatory devise for the differences in purchases of substitutes and non-substitutes. | Cola: $R^2$ 0.972-0.982 Butter: $R^2$ 0.979-1 |

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| Hantula, DiClemente and Smith (2008) | Delay and handling time, Time discounting, Patch Residence. | Online purchasing of CDs- delay to in stock information. Store preference. Time allocation. | Quantitative: Experimental analysis in a simulated internet mall. | Hyperbolic discount functions provided the best fit to the data for both purchase and time allocation (patch residence). | $R^2$ 0.960 |
| Hantula and Schoenfelder (in press) | Marginal Value Theorem. Also matching and hyperbolic discounting. | Capital investing behaviour. | Quantitative: Experimental analysis –capital funding six divisions on a large organisation. | Capital investors preferred options that provided greater variability in rate of return (ROR) to options of lower or no variability despite the fact that all options provided the same overall ROR. Hyperbolic discount functions provided the best fit to the data. | $R^2$ 0.91 |

Figure 1: A diagrammatical comparison of foraging and traditional consumption models/theories