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Selective differences between naive and experienced cattle foraging among eight grasses

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Abstract

Cattle are often required to adapt to new forages when they are moved to new pasture. The objectives of this research were: (1) to determine how rapidly naive cattle express clearly defined preferences when they encounter a new array of forages, and (2) to compare their evolving forage preferences and grazing behavior with those of experienced cattle. Three naive and three experienced yearling-steers were grazed in experimental paddocks supporting equal numbers of eight different caespitose grasses, and the number of visits to plants and number of bites harvested were monitored. Experienced steers immediately began grazing preferred forages, and throughout the trials, 90% of their visits were made to the two preferred grasses, giant wildrye (*Elymus cinereus* Scribn. and Merr.), and 'Nordan' crested wheatgrass (*Agropyron desertorum* (Fischer ex Link)Schultes). After the naive steers had sampled only nine individual plants, they selected the same two grasses as the experienced steers at significantly ($P = 0.05$) higher frequencies than expected by chance. Diets of the naive steers, however, remained significantly different ($P = 0.001$) from the experienced steers for the duration of the trials, so we could not determine the amount of exposure or time required for the selective patterns of the two treatments to approach parity. Across the 4-day trial, 97% of total bites by the experienced animals were from the two preferred grasses, while the naive animals took only 88% of their total bites from the same forages ($P = 0.001$). Naive steers were also more likely to abandon a plant after harvesting a single-bite of forage (37%) than the experienced steers (19.5%). In approximately the same amount of time, naive steers harvested 21% fewer total bites than experienced animals, suggesting that naive

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animals were less efficient grazers. If naive cattle are introduced to an array of new forages, they may begin expressing dietary preferences paralleling those of indigenous animals within less than 5 min. Researchers, however, should not assume that naive cattle will provide an accurate depiction of the dietary composition of native stock, because naive cattle may sample a broader array of forages than their experienced counterparts and harvest fewer bites than experienced cattle from the preferred forages. Further research over more than 4 consecutive days will be required to determine the time necessary for 'naive' animals to be considered 'experienced'. These data also suggest that active cattle management may be focused on relatively few species even when pastures contain a heterogeneous mix of forages.

Keywords: Cattle-feeding and nutrition; Preference; Palatability; Foraging behaviour; Diet selection

1. Introduction

For optimum animal performance livestock must harvest nutrients in an effective and efficient manner. Each pasture presents an animal with a unique environment; and the more knowledge the animal has about its environment, the greater its ability to graze efficiently (Senft, 1989). Relative to forage selection, the literature supplies listings of the most prominent plants occurring in the diets of both wild and domestic herbivores in many environments (e.g., McInnis and Vavra, 1987; Tixier and Duncan, 1996). Also, the roles of feedback mechanisms, social stimuli, and animal experience in shaping dietary habits have been the focus of recent research (Langlands, 1969; Thorhallsdottir et al., 1987; Flores et al., 1989; Provenza et al., 1992; Provenza, 1995; Ralphs, 1997). When encountering novel foods, animals initially ingest only small amounts. If no negative consequences occur, they may consume progressively more of the item until it eventually becomes an accepted food (Launchbaugh et al., 1993).

To date, there has been little research into how selection and preference evolve in free ranging animals without the presence of aversive compounds. Chapple and Lynch (1986) exposed naive sheep to wheat for 15 min a day, and 13 days passed before as much as 10 g were eaten in a single period. There is no documentation, however, on the short-term development of selection and preference in cattle exposed to new forages. Cattle are often forced to adapt to different forages, because ownership and environments may change several times during their life. Movements to new pastures can cause a short-term depression in weight gains (McIlvain and Shoop, 1971). These reduced gains may be related to increased activity involving exploration or reestablishment of social order (McIlvain and Shoop, 1971), the acclimation of rumen micro-organisms to new forages (Chruch, 1976), lack of skill at foraging on different life forms (Flores et al., 1989), or the duration of time required to learn about new forages (Carulla et al., 1991).

The objectives of this research were: (1) to determine how rapidly naive cattle develop a preference for major dietary components when exposed to new forages, and (2) to compare their developing preferences and behavior with that of experienced cattle. This was accomplished by observing naive and experienced steers as they grazed in experimental paddocks with fixed densities of plants and recording the number of individual plants visited and bites harvested from each.

2. Materials and methods

The study was conducted in June 1994 on the Northern Great Basin Experimental Range, 72-km west–southwest of Burns, OR in six experimental paddocks. Mean annual precipitation for the area is 284 mm with peak accumulations during winter months (29–36 mm/month) and a minimum monthly accumulation (8 mm) in July. Mean annual temperature is 7.6°C with recorded extremes of −29 and 42°C. Soil in our holding pasture and experimental paddocks was a complex of loam and loamy fine sands (Milican coarse–loamy, mixed, frigid Orthidic Durixerolls and Holtle coarse–loamy, mixed frigid Ariddic Duric Haploxerolls; Lentz and Simonson, 1986) with depth to bedrock or hardpan ranging between 90 and 150 cm.

Six experimental paddocks were established in March and April of 1989. Plants of eight different species of grasses were excavated from nearby native and improved pastures on the experiment station and replanted in the paddocks. Each paddock contained a grid of 29 rows and 29 columns, for a total of 841 intersections with 0.61 m between centers. One hundred specimens of each forage were established in each paddock leaving a total of 41 empty intersections and 800 established plants in each row:column matrix. The position of each plant in a grid was determined with a randomized computer drawing, and an independent drawing was conducted for each paddock. This completely randomized arrangement prevented animals from settling in a given row or column and focusing their grazing activities on a single forage. Also, since 100 individuals of each forage were present, the probabilities ($P = 0.125$) of a steer encountering the various species were equal. The eight grasses used were: bluebunch wheatgrass (*Agropyron spicatum* (Pursh) Scribn. and Smith), Idaho fescue (*Festuca idahoensis* Elmer), bottlebrush squirreltail (*Sitanion hystrix* (Nutt.) Smith), needle-and-thread grass (*Stipa comata* Trin. and Rupr.), Sandberg's bluegrass (*Poa sandbergii* Vasey), Thurber's needlegrass (*S. thurberiana* Piper), giant wildrye (*Elymus cinereus* Scribn. and Merr.), and 'Nordan' crested wheatgrass (*A. desertorum* (Fischer ex Link)Schultes). These grasses have a wide geographic distribution, and one or another typically dominates the herbaceous layer of sagebrush/steppe communities in the region (Daubenmire, 1970; Hironaka et al., 1983). All of the grasses are caespitose (bunchgrasses), and paddocks were mowed to a 5-cm stubble each fall to prevent accumulations of standing-dead material that can occasionally influence selection among grasses (Murray, 1984). Weeds were hoed as necessary.

Six yearling Hereford × Angus steers (three experienced and three naive), with a mean weight of 285 kg, were used in the trials. The three experienced steers summered (1 May–15 October) as calves in three native rangeland pastures containing the eight forages used in these trials. To characterize the rangeland vegetation (Table 1) we measured the frequency of occurrence of grasses in 50 randomly placed 1 m^2 plots in each pasture (Piper, 1973). The experienced steers wintered (16 October–1 May) on harvested hay, primarily meadow foxtail (*Alo. pratensis* L.), and returned to native

Table 1
Mean ($n = 3$, ± SE) frequency of occurrence (percentage of 1 m^2 plots in which plants occurred) of prominent rangeland grasses sampled in 50 plots in each of three native sagebrush/steppe pastures where experienced steers summered as calves on the Northern Great Basin Experimental Range near Burns, OR in May 1994

Species	Frequency (%)
Giant wildrye	6.0 ± 2.3
Crested wheatgrass	24.0 ± 4.0
Idaho fescue	30.7 ± 16.7
Bluebunch wheatgrass	61.3 ± 11.6
Needle and thread grass	–[a]
Bottlebrush squirreltail	11.3 ± 7.7
Sandberg's bluegrass	94.7 ± 1.8
Thurber's needlegrass	30.0 ± 12.1
June grass[b]	64.0 ± 12.9
Cheatgrass[b]	30.7 ± 7.4

[a] Present but not encountered in sampling.
[b] Grasses not included in the grazing trials.

rangeland pasture for an 8-day familiarization period immediately before these trials. The naive animals summered as calves on tall fescue (*F. arundinacea* Schreb.) pasture, wintered with the experienced calves on meadow foxtail hay, and were held on meadow foxtail pastures until just before the trials began. All the steers were gentled over the winter by technicians who tethered the animals before feeding each day.

Prior to the grazing trials, numbered cards (1–29) were penned to the ground outside of an electric fence along the rows and columns of each experimental paddock. These cards allowed two technicians to rapidly document the X and Y coordinates of each plant as a steer grazed within the fenced paddock. The data were subsequently key-punched and custom software used to match the locations grazed with the species of grass in each row/column intersection. With the exception of Sandberg's bluegrass, which had already exerted reproductive stems and flowered, the grasses were in the late-boot stage of phenology, so they provided an abundance of succulent, leafy material for the steers.

Project design was a randomized complete-block with three replications and two treatments (naive and experienced steers). Within each replicate, one paddock was randomly assigned to a naive steer and an experienced steer assigned to the second. Each steer foraged exclusively in its own paddock to reduce the potential influences of social facilitation (Scott et al., 1996; Ralphs, 1997), and each steer used the same paddock on subsequent days. Paddocks within a replicate were only about 5 m apart, so there was some opportunity for steers to observe one another feeding.

The trials were conducted over four successive mornings in June, 1994. Each morning the steers were brought to the area in a stock trailer and tethered just outside of their assigned paddocks. When a steer was released to graze, two technicians with pencils and clipboards recorded the row/column coordinates of each plant grazed. A third technician, equipped with a laptop computer accompanied the animal at a distance of 1 to 5 m and recorded each bite by pressing the space-bar. A bite was defined as either a visible or audible indication that a steer had severed material from a plant. Each depression of the computer's space-bar stimulated the recording of a time entry (i.e., 08:10:56.1) by the computer. When the animal abandoned a plant and began searching for another, the technician pressed the 'W' key. A 'W' entry in the accumulating file served as a break between bites on successive plants. Audible communications among technicians assured that counts of grazed plants and data acquisition remained synchronized. Returns by steers to previously utilized plants were also recorded as visits, and each steer was allowed to forage until it had grazed from 100 plants, regardless of the time required. The animal was again tethered outside its paddock, and the procedure repeated with the remaining paddocks and steers until all had grazed. After trials, the steers were held overnight in a common corral with meadow foxtail hay and water available.

The variables compiled from these data included: (1) a sequential listing of the cumulative number of visits the steers made to either of the two preferred forages, giant wildrye and 'Nordan' crested wheatgrass, (2) the total number of bites harvested from each of the eight grasses, (3) the number of times a steer abandoned a plant after harvesting only a single bite, and (4) the total number of plants of each grass the steers foraged on in each paddock. This count excluded any later visits and regrazing of plants on subsequent days. Data from variable 1 were analyzed with a split-plot analysis of variance. Because a series of successive days cannot be randomized, days ($n = 4$) served as whole-plots and treatments ($n = 2$) as the split-plot. The replication × day error term (6 *df*) was used to test for day effects, and the replication × day × treatment error term (8 *df*) was used to test for treatment and treatment × day effects (Petersen, 1985). Data were initially graphed to illustrate the overall patterns of selective grazing by naive and experienced steers. Variables 2 and 3, depicting total bites taken from each forage and the frequency of single-bite visits to plants, were analyzed with a split-plot design with days ($n = 4$) as whole-plots and treatments ($n = 2$) and species of forage ($n = 8$) as a factorial set of split-plots. The replication × day error term (6 *df*) was used to test for day effects, and the replication × day × treatment × species error term (120 *df*) was used to test for treatment ($n = 2$), species ($n = 8$), and interaction effects. Variable 4, the count of plants by species that were grazed in each paddock over the 4-day trial, was analyzed with a randomized complete block design (three replications) using a factorial approach for treatment ($n - 2$) and species of forage ($n = 8$) Treatment (1 *df*), species (7 *df*), and interaction effects (7 *df*) were tested for significance with the replication × treatment × species (30 *df*) error term. Statistical significance was assumed at $P < 0.05$, and mean separations were accomplished with Fisher's Protected LSD procedures.

3. Results

Among trials and between treatments the mean duration of grazing sessions was 37 (SE = 1.6) min with a range of 26 to 56 min. Naive steers grazed for about 4 min longer (39 min SE = 2.6) than experienced animals (35 min SE = 2.0), but this difference was not significant ($P = 0.17$).

The number of visits naive ($n = 867$) and experienced steers ($n = 1083$) made to the two preferred grasses differed significantly ($P = 0.002$). Had the three steers in each treatment foraged randomly among the eight selections, each grass would have received 12.5% or 150 of the visits. With random selection, we would expect the cumulative score for any two forages to be approximately 25% or 300 visits. Across all 4 days of the trials, the experienced steers made 90% of their visits to the two preferred grasses, while the naive steers sampled preferred grasses 72% of the time. Day effects ($P = 0.72$) and the day × treatment interaction ($P = 0.75$) were not significant, suggesting the selective patterns of both the naive and experienced steers were consistent throughout the trials. A graphic representation of the rates at which the steers selected giant wildrye and crested wheatgrass, however, illustrates that some disparities in the steers' selective behavior are masked if interpretations are based only on the tallies at the end of each daily grazing session (Fig. 1).

On the first day when experienced steers initially entered the paddocks, all of them fed exclusively on the two preferred grasses for the first nine plants selected (Fig. 1). After they had visited 20 plants, 93% of their selections were derived from the two preferred grasses, and this declined to 91% after they had visited 30 plants. At the end of the daily grazing sessions, the experienced steers had visited the two preferred forages 90, 90, 89, and 91% of the time for days 1–4, respectively. The naive steers exhibited more variation with 74, 75, 63, and 77% of their visits to the two preferred forages for days 1–4, respectively.

With the exception of day 1, there appeared to be a brief period at the beginning of each daily trial where steers sampled a few plants before settling into giant wildrye and

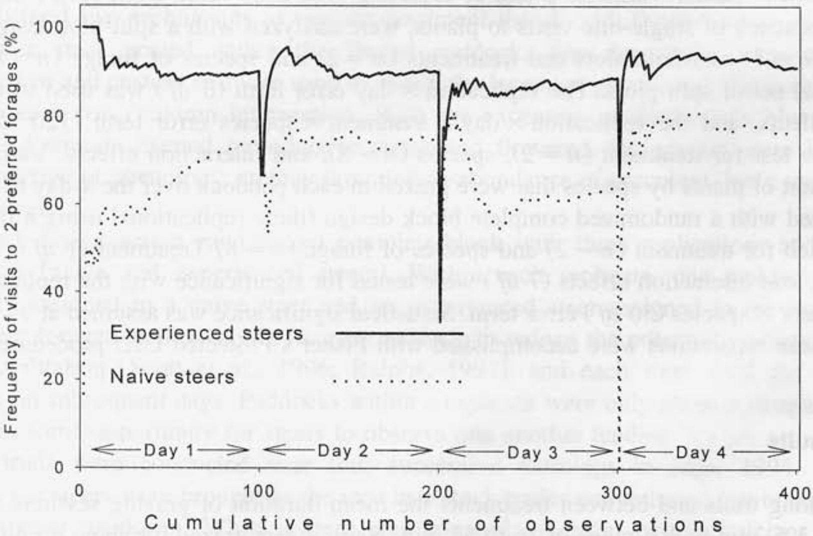

Fig. 1. The mean ($n = 3$) frequency of visits (%) by naive and experienced steers to either of the two preferred grasses (giant wildrye and crested wheatgrass) as they foraged in experimental paddocks supporting equal densities of eight different forages on the Northern Great Basin Experimental Range near Burns, OR. Data were tallied for the first 100 plants grazed for each of 4 days. N for determining percentages for each steer on each day ranged from 1 to 100.

crested wheatgrass at relatively constant rates (Fig. 1). Also notable was the relatively rapid rate at which the naive steers began to feed on giant wildrye and crested wheatgrass during their first entry. After the naive steers had sampled only 9 plants (a period of 5 to 6 min), they were selecting giant wildrye and crested wheatgrass at significantly ($P < 0.05$) higher rates than would be expected by chance. After they had foraged on only 10 plants, 47% of their visits were to the two favored grasses. After 20 visits, the naive steers had selected preferred plants 55% of the time, and this was elevated to 59% after 30 visits.

Over the 4 days of grazing trials, a total of 21,197 bites were recorded among the steers, and there were significant effects for species of forage ($P < 0.001$) and the treatment × species interaction ($P = 0.001$). These effects indicated the steers did not harvest an equal number of bites from among the eight forages and that naive and experienced steers did not always harvest equal numbers of bites from a given forage (Table 2).

Giant wildrye and crested wheatgrass were clearly the preferred grasses for both the naive and experienced steers, but on a daily basis, the experienced steers consumed 30 to 40% more bites from these two grasses than the naive animals. On a percentage basis, 97% of total bites for the experienced animals were derived from the two preferred grasses, while the naive animals took only 88% of their total bites from those same forages.

No mean separations occurred among the remaining six grasses either within or between treatments (Table 2). However, on a daily basis, the experienced steers consistently harvested fewer bites (130) from the six less preferred grasses than the naive animals (270 bites). Among all of the grasses, the naive steers harvested 21%

Table 2
Mean ($n = 12$, ± SE) number of bites harvested/daily grazing session and the total number ($n = 3$, ± SE) of plants actually grazed (excluding regrazing events) throughout the 4 day trail by naive and experienced steers in paddocks supporting equal densities of eight different caespitose grasses on the Northern Great Basin Experimental Range near Burns, OR in the spring of 1994

Species of forage	Variables			
	Bites harvested		Total plants grazed	
	Naive	Experienced	Naive	Experienced
Giant wildrye	541.8 ± 55.3c[1]	764.5 ± 72.9c	56.0 ± 1.0c	59.0 ± 6.8c
Crested wheatgrass	149.4 ± 37.6b[2]	194.8 ± 36.0b	35.3 ± 5.9b	45.3 ± 11.7b
Idaho fescue	32.0 ± 9.9a	5.4 ± 2.8a	20.3 ± 5.8a	5.3 ± 1.2a
Bluebunch wheatgrass	15.7 ± 3.2a	8.7 ± 2.5a	17.0 ± 1.7a	8.7 ± 2.3a
Needle and thread grass	13.8 ± 2.7a	7.1 ± 2.5a	13.7 ± 1.9a	7.0 ± 3.1a
Bottlebrush squirreltail	9.9 ± 3.5a	5.1 ± 1.7a	13.7 ± 4.5a	4.7 ± 1.5a
Sandberg's bluegrass	8.9 ± 2.7a	1.4 ± 0.6a	7.7 ± 2.2a	2.0 ± .0.6a
Thurber's needlegrass	6.3 ± 2.3a	1.7 ± 0.6a	10.0 ± 0.6a	2.3 ± 0.7a
Mean	97.2 ± 19.6	123.6 ± 27.5	Sum 173.7 ± 8.8	134.3 ± 22.8

[1]Means in columns sharing a common letter are not significantly different ($P > 0.05$).
[2]Underlined means in rows within a variable are significantly different ($P < 0.05$).

Table 3
Mean ($n = 24$, ± SE) frequency (%) of single-bite visits among eight different grasses grazed by naive and experienced steers on the Northern Great Basin Experimental Range near Burns, OR in the spring of 1994

Species of grass	Single-bite visits (%)		
	Naive steers	Experienced steers	Mean ($n = 48$)
Giant wildrye	15.7 ± 1.3	12.2 ± 2.1	13.9 ± 1.3a[1]
Crested wheatgrass	12.8 ± 2.1	10.3 ± 1.7	11.5 ± 1.4a
Idaho fescue	36.5 ± 8.6	18.3 ± 9.5	27.5 ± 6.5abc
Bluebunch wheatgrass	51.9 ± 8.4	29.8 ± 9.6	40.9 ± 6.5cd
Needle and thread grass	42.5 ± 8.3	33.3 ± 11.4	37.9 ± 7.0cd
Bottlebrush squirreltail	54.6 ± 10.7	35.8 ± 12.1	45.2 ± 8.0d
Sandberg's bluegrass	33.6 ± 11.7	0.0 ± 0.0	16.8 ± 6.7ab
Thurber's needlegrass	51.1 ± 13.3	16.7 ± 11.2	33.9 ± 9.2bcd
Mean ($n = 96$)[2]	37.4 ± 3.4	19.6 ± 3.2	

[1] Means in column 4 sharing a common letter are not significantly different ($P > 0.05$).
[2] Underlined treatment means are significantly different ($P = 0.001$).

fewer total bites than the experienced steers, but the difference between treatments was not highly significant ($P = 0.078$).

Overall, the steers removed a single bite and abandoned a plant 29% of the time. Main effects of treatment and species were significant ($P < 0.001$) in analyses of single-bite visits. Day and interaction effects were not ($P > 0.49$), so data were pooled across treatments before mean separations were evaluated among forages (Table 3). Thirty-seven percent of the time, the naive steers harvested a single bite and then abandoned a plant, while the experienced steers exhibited this behavior only 19.5% of the time. Generally, single-bite visits were less likely to occur with the two preferred forages (giant wildrye and crested wheatgrass) than with the remaining six grasses (Table 2).

Over the 4-day trial, each steer was monitored as it grazed at 400 locations. Averaged across treatments, the mean number of plants actually grazed in a paddock was only 154. This indicated that returns to plants and regrazing efforts made up more than half of the foraging activity (Table 2). Treatment and species effects were significant ($P < 0.02$), but interaction effects were not ($P = 0.11$). After the trials ended, 56 to 59% of the giant wildrye plants had been grazed in each paddock, and 35 to 45% of the of the crested wheatgrass plants had been utilized. This suggested that selective opportunity still existed when the trials were terminated. Among the six less-preferred grasses, utilization ranged from 2 to 20%.

4. Discussion and conclusions

Naive steers rapidly adapted to a novel array of grasses, and they began focusing their attention on the same species of forages as experienced animals after only a brief (5 to 6 min) sampling period. After visiting only nine plants, the naive steers were exhibiting the same preferences as the experienced animals. At the end of our 4 sampling periods, however, the selective patterns of the naive and experienced steers still had not reached parity. If we assume that our bite count data are an accurate index of diet composition (Table 2), then 97% of the experienced steers' intake was derived from giant wildrye and crested wheatgrass, while the naive steers extracted 88% of their diet from these same two grasses.

These results suggest that one may use naive cattle in grazing trials if the objective is simply to identify the most preferred forages. If one's objective is an accurate assessment of dietary composition of indigenous cattle, however, then animals used for sampling should certainly have more experience in the environment than our naive steers acquired in these trials. We suggest that naive cattle would probably exhibit a more diverse diet than experienced animals. Our trials were terminated after 4 days because we did not want to limit the steers' selective opportunities. Additional work is needed to accurately establish the time required for naive animals to adopt the same selection and preference patterns as indigenous animals.

Other workers using oesophageally fistulated cattle have noted occasionally that their animals provide unreliable estimates of diet composition relative to resident stock (Jones and Lascano, 1992). We speculate that in many instances these differences may be a function of animal experience and not a product of surgical procedures. Typically, fistulated animals are maintained separately, so their husbandry can be more easily managed. This is especially true of oesophageally fistulated cattle. For research purposes, oesophageally fistulated animals should be given greater opportunity to forage with native herds if we expect them to exhibit the same selective patterns as indigenous stock. Also, oesophageally fistulated cattle are frequently released and left to forage alone, so the company and social facilitation of indigenous animals might also stimulate them to adopt a diet more in line with native herds (Ralphs et al., 1994).

It should be mentioned that the six steers in these trials derived the bulk of their diet (88 to 97%) from two of the eight selections of grasses available. In previous work, we have seen cattle extract 81% of their diet from a grass that was 6% of the total herbage mass or only 3% of the total plant cover or density (Cruz and Ganskopp, 1998). To maintain these key species in pastures of mixed composition, a manager's decisions should be based on the timing and degree of utilization endured by these key plants. Less palatable forages may gain a competitive advantage, because they do not have to endure the vicissitudes of repeated defoliation.

In other work with these same grasses, we attempted to use several indices of nutritional value, mineral and moisture content, plant morphology, herbage mass, and the probability of encountering individual forages at pasture to consistently predict the selective patterns of cattle on mixed composition range (Cruz-Guerra, 1994; Cruz and Ganskopp, 1998). With step-wise regression analyses, strong correlations can be obtained relating the selective patterns of cattle to one or more of these variables at specific points in time. We cannot, however, consistently predict which forages will be most acceptable to cattle, because different variables enter the models as plant phenology advances.

Our data in this study are also related to the issue of foraging efficiency. Relative to total time spent foraging, the naive steers needed 39 min to visit 100 plants, and the experienced steers used only 35 min. Because these values were not significantly different ($P = 0.17$), however, we will assume the steers in the two treatments spent an equal amount of time grazing and examine the other two variables. The naive steers were almost twice as likely to harvest a single bite and abandon a plant than were the experienced steers (probabilities of 0.38 and 0.20, respectively), and on average the naive steers harvested 21% fewer bites each day than the experienced steers. If we assume bite-counts are an accurate reflection of intake, then our naive steers were 21% less efficient at foraging than their experienced comrades. Readers are reminded, however, that the difference between treatments in total bites harvested each day was not highly significant ($P = 0.078$).

Others have observed that naive animals may not have the dexterity required for efficient foraging, particularly when they are forced to make transitions to novel life-forms (i.e., grass, forb, shrub, or tree). This has been noted in lambs and goats with their first efforts at browsing (Flores et al., 1989; Ortega-Reyes and Provenza, 1993). The steers in our studies spent equivalent time at pasture and were not asked to graze from a novel life-form, so we believe they should have possessed equal abilities at handling and harvesting the grasses in question. We are planning additional research to address the foraging and nutritional efficiencies of naive cattle.

In conclusion, when naive cattle are introduced to an array of new forages, they will, within minutes, express dietary preferences similar to those of indigenous animals. Researchers, however, should not assume that naive cattle will provide an accurate depiction of the dietary composition of native individuals. Indeed, naive cattle may sample a broader array of forages than their experienced counterparts. With our experimental design, we could not determine the amount of exposure or time required for the diets of naive and experienced cattle to approach parity, and further research is needed to address that question. Also, because both naive and experienced steers extracted a large proportion of their diet (88 to 97%) from a relatively small component of the species on offer, stockmen should be able to quickly identify key species of forages in mixed composition pastures, and apply management techniques that will assure their persistence. Lastly, it appeared that naive cattle may be nutritionally disadvantaged because they do not forage as efficiently as their experienced associates. Further research is needed, however to address the various implications of this observation.

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