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COASTWATCH

Photo by Gene Furr

Was the Phantom real? Sometimes he wondered. She had never been captured, and the roundup men did sometimes tell tall tales. Some had said she was a dark creature, dark and mysterious, like the pine trees. And

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some said she was the color of copper, with splashes of silver in her mane and tail.

These lines from Marguerite Henry's *Misty of Chincoteague* have struck a chord in many a boy or girl who loved the idea of wild ponies roaming free on a wind-swept seacoast island. And for generations the legends of two Maryland and Virginia islands, Chincoteague and Assateague, have been the stuff of youthful dreaming.

Less celebrated, but no less wild and romantic, are the "banker horses" of North Carolina's barrier islands. From Corolla to Carrot Island, the feral herds have made the banks their home, grazing the salty marsh grass, struggling to live where only the tough survive.

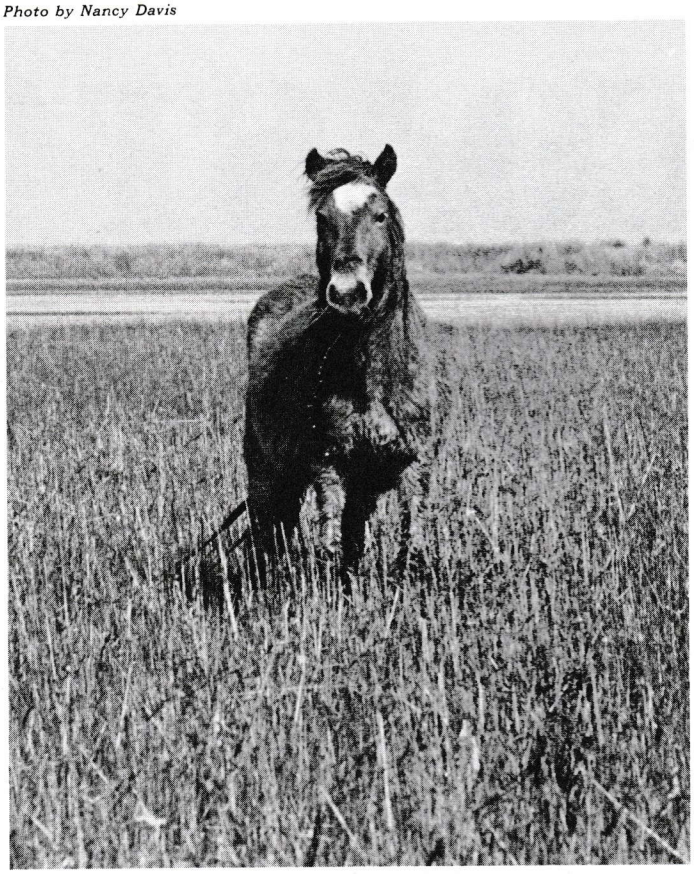
Scientists call them horses, descendants of the small, sure-footed steed of Spanish conquistadors. And because of the horses' size, people Down East have for years spoken of the herds with affection as "ponies."

Nobody knows exactly how they came to the islands. Did they swim to shore from 16th century Spanish shipwrecks? Did they arrive with an ill-fated Spanish colony, even before the English did?

However they first came, we know that one of the first uses of the Outer Banks was for free-range grazing, not only for horses but also for cattle, sheep and goats. Islanders sometimes rode the horses, or worked them, or sold them away to small farms on the mainland.

The days of the plow horse are gone, but the horses remain. On Ocracoke, they grow sleek and pretty in their fenced pasture, under the care of park rangers. Each year, they draw thousands of tourists. But on Carrot and Shackleford, they roam free, unkempt and mostly unnoticed, wild as the wind.

Photo by Nancy Davis



Grazing in Shackelford's salt marsh

And now, after hundreds of years on these islands, the future of some of these herds is in doubt, and officials face tough decisions about what should be done.

This month, *Coastwatch* looks at the free-spirited horses of North Carolina's Outer Banks.

Photo by Neil Caudle

Photo by Jeannetta Henning

Ocracoke's horses still bear the features of their Spanish ancestors

Meet the kin: Mr. Bob, Paint and Owen K. Ballance

There's a family, a special breed you might say, who has survived, generation after generation, on Ocracoke Island. While no one is sure how they arrived there, it is believed they have been island residents for over 400 years. Bringing to Ocracoke a hot-blooded Arabian ancestry and an intelligence born of Spanish breeding, the family adapted to the harsh environment of the banks, weaving their family history intricately into the fabric of the island culture and history.

Ocracoke's first family is not human, but equine. They're a herd of Spanish horses, whose ancestry combines the breeds of Arabian, Barb, Andalusian and Spanish stock horse to make a horse coveted for its endurance, adaptability, strength and intelligence.

The Spanish conquistadors brought hundreds of the horses to the Americas during the early years of exploration. They took so many of Spain's prized stock that the Spanish emperor placed a ban on further export of the horses in 1520. But by then, breeding farms had already been set up in Cuba, Puerto Rico and Santo Domingo to supply the Spanish with horses.

But just how these Spanish horses got to Ocracoke is the cause of great speculation. Spanish fleets, carrying cargoes of newly found American riches, often traveled a route which carried them close to Cape Hatteras and Ocracoke. Some say one or more of these ships wrecked, leaving a small herd that survived and flourished. And others believe they were left by an expedition led by Sir Thomas Grenville, an Englishman.

In her search for the horses' story, Jeannetta Henning has found old histories that talk of a Spanish settlement in 1526 in the Cape Fear region of North Carolina. Jeannetta has worked with her husband, Jim, a park ranger, to care for the horses and has spent seven years researching their heritage. The Spanish histories, based on the logbooks of exploration voyages, note that 500 people and 80 or 90 horses settled the area in July of 1526. According to the logbook, the colony failed later the same year. Jeannetta believes the horses were left behind, and she thinks the herd eventally spread up the Outer Banks. But no matter how the horses arrived, they survived, adapted and multiplied.

Horses were common along the Outer Banks during the 1600s. Many colonists used the islands to not only graze horses, but to graze sheep, cattle and goats as well, says David Stick, Outer Banks historian. But for the most part the colonists were absentee landlords, who did not live on the Outer Banks. It was 1715 before Ocracoke village, then called Pilot Town, was established.

The horses, often called banker horses or ponies, roamed the island in herds, says Jim Henning. They ate marsh grass and drank fresh water from holes they dug in the ground.

Each herd had a boss mare who led the herd in flight and to food, says Jeannetta. The boss mare was the first to eat and the first to drink. Each herd also had a stallion who protected the mares and the young, and kept the herd orderly.

The herd stallion was an excellent father to his young, and the colts and fillies actually spent more time with the stallion than with the mare, says Jeannetta. But when a young male reached two years of age the head stallion drove the male out of his herd.

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"It was the only place I knew where the people were fenced in and the horses allowed to run free."
—Jim Henning

"It was nature's way of keeping the horses from inbreeding," Jeannetta says.

Many of the Ocracoke villagers once owned one or more of this Spanish herd. Some of the horses were broken and trained for riding, plowing and pulling the carts that delivered grocery orders every Saturday, says Jeannetta. The Life Saving Service rode them to patrol the beach and haul wood washed up from shipwrecks.

Each July Fourth, islanders herded the horses together, branding colts and picking out some of the older horses for sale or training.

Lawton Howard, who grew up on Ocracoke and retired there 16 years ago, remembers the pennings that took place next to the island's only school. About 15 men would leave the village late on the night before the Fourth and ride to the north end of the island, Howard says. At daybreak the men would begin herding the horses southward. Some of the horses escaped roundup by swimming into the sound, Howard says. By around noon on the Fourth the men would herd the horses into the village and the pen that awaited them by the school.

"There were a coupla fellas here that caught the horses with their bare hands," Howard says. "No one believes me when I tell them that. But it's true. My father, Homer Howard, was one of 'em. They would grab the horses by their mane, then throw one leg in front of the horse's legs so they wouldn't get trampled. They'd grab their nostrils and hold on until the horse was out of wind and could be roped."

To break the horses, villagers would fill an old pair of pants with sand and place it on the horse's back, Howard says. Sometimes the islanders blindfolded the horses to keep them from kicking and rearing as they broke them. Or they stood the horses in water, where it was impossible for them to kick, he says.

Once broken the horses are a gentle lot, says Jeannetta. "They're very human oriented," she says. "They're highly tuned, sweet-tempered and not nervous. They'll nuzzle right up to you. A lot of the people here on Ocracoke grew up with at least one of the horses in their backyard."

The horses took on a new prominence in the 1950s when *Boys Life* magazine discovered the Ocracoke Boy Scout troop was the only mounted troop in the country. Each scout trained and cared for his own mount. "The national publicity stirred a great deal of feeling for the horses here on the island," Jeannetta says.

In 1957, when the highway was built that ran the length of the island, the horses were corralled for the first time. Until then, villagers had surrounded their yards and homes with wooden fences to keep the horses out.

"It was the only place I knew where the people were fenced in and the horses allowed to run free," Jim says.

After the highway was completed, the Boy Scout troop took over care of the small herd. The scouts looked after the horses until the late 1960s when the U.S. Park Service took over the care because the troop had dwindled and the expenses had become a burden.

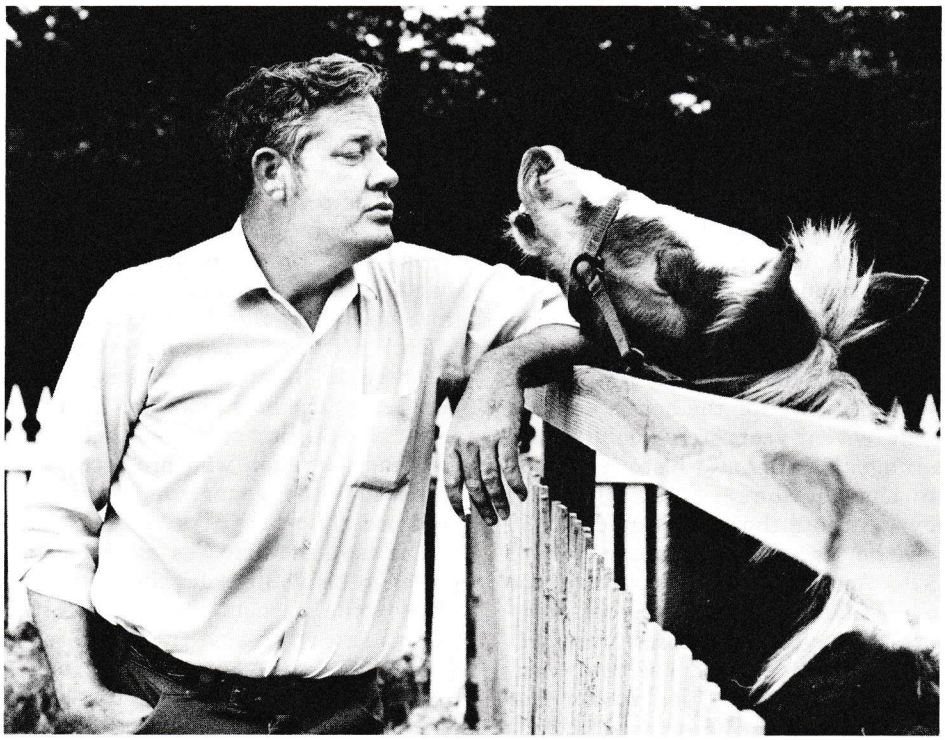
When the Park Service took over the horses, the herd was on the decline. At one time the herd was as low as nine horses, Jim says. Jeannetta raised three foals by bottle to keep them alive, he says. A breeding problem had developed.

The remaining stallion and three of the mares were not compatible mates. The result was foals born with a condition called hemolytic anemia. The mare's milk contained antibodies that destroyed the red blood cells in the foals, which died soon after birth.

Dr. Thomas Bruce, director of the state's Animal Disease Diagnositic Laboratory in Edenton, says the disease is not uncommon. Bruce says inbreeding contributes to the disease's occurence, but is not the cause. To solve the problem, an Andalusian stallion was brought in for breeding purposes. Since the stallion's arrival three healthy foals have been born, Jim says.

While Bruce studied the horses health problems, Dr. William Stabler, a Houston, Miss., veterinarian and an examiner for the Spanish Mustang Registry, has been studying the horses'

Photo by Cassie Griffin



Jim Henning chatting with a neighbor

bone structure and their similarity to old Spanish breeds. He says at least 10 horses in the herd are purebreds. They have five instead of six lumbar vertebrae, a distinct characteristic of the Spanish horse. Upon Stabler's recommendation, the horses were recognized by the Spanish Mustang Registry.

A mixture of circumstances kept the bloodline of the horses pure. The horses tended to reject mates of different breeds. And the isolation of Ocracoke made it hard to transport horses on and off the island. Also many islanders took pride in the horses' Spanish breeding and wished to keep the bloodline pure, Stabler says.

And fate, says Jeannetta, may have added to the horses' purity. One mixed-breed herd was killed during a hurricane that struck the island, she says. Others were sold. And several horses brought to the island for breeding died because they could not withstand the swarms of salt-marsh mosquitoes and green-head flies and a diet of tough salt marsh grass.

"You can tell a Banker pony as far as you can see it," Jeannetta says. "They have a short back. They're short-legged and thick chested. They have a proud neck and a long tail and mane. It's only when you get close to them that you can see the Barb, the Andalusian and the Arabian in their faces and shapes."

The size of the herd has risen back to the 21 horses present today. And now each horse carries a name—Paint, Mr. Bob, Rainbow, La Baronesa, Owen K. Ballance. The herd is kept for the most part in an 168-acre pasture, just off the highway that runs between the Hatteras ferry landing and Ocracoke village. Observation stands have been constructed by the Park Service for visitors to view horses.

But the islanders still call the horses their own. "The people here know they have something unique, something as much a part of Ocracoke as they are," says Jeannetta. "A debate rose when the Park Service considered training a few of the horses for beach control. Several people thought the horses should not be worked. But one Ocracoke old-timer spoke up and said, 'Look at it this way folks, I never had the urge to walk up to one of those Parks Service jeeps and pat it on the head.'"

—Kathy Hart

Photo courtesy of Division of Archives and History

Roundup on the banks

For generations, people—mostly from Harkers Island fishing families—have gathered once a year on Shackleford Banks to pen and brand the island horses. A photo from 1907 (above), "Catching a wild pony," by M. B. Gowdy, captures the flavor of fisherman-turned-cowboy.

Early roundups supplied local farms with plowhorses and island families with some income. Today, the roundups continue, but mainly to keep a tradition alive. Each July, the herders fan out on Shackleford's wooded west end, driving the horses toward a pen on the eastern grassland.

For the rest of the year, people leave the horses alone. And foals like the one at left, though they may wear a brand, spend their lives running free on the island.

Who'll decide horses' future—nature or man?

A sorrel mare dips her head into brackish marsh water to pull up fresh shoots of sea grass. It's spring and she's survived on tough dune grasses for most of the winter. Here and there lie the carcasses and bleached bones of several horses that didn't make it through the winter. Perhaps they mired down in marsh mud and were too weak to pull themselves out.

Across the marsh, another mare is grazing. This one has a foal by her side. It was probably born a few months before, the toughest time for the horses—the time when food is running out and the fresh grass hasn't begun to grow yet.

The horses of Shackleford Banks and Carrot Island survive in a harsh environment. They eat the salty grasses and paw in the sand for a sip of brackish water. In the summer, they stand in 100-degree weather and endure biting flies and swarming mosquitoes. In the winter, they seek shelter behind the dunes from freezing winds, their coats becoming thick and shaggy. But somehow, the horses have adapted to the island's harsh environment.

Daniel Rubenstein, a Princeton biologist, says that islands, because of their ruggedness, extreme climates and fluctuating freshwater levels, "provide habitats that must be adapted to in novel ways."

Rubenstein says he has watched banks horses drink salt water—an adaptation that would probably indicate some drastic modification in the horses' kidneys. But no physiological studies have been done on the animals, and at least one doctor is skeptical.

"That the horses could drink salt water is beyond the realm of comprehension. I think it's a myth," says William B. Blythe, professor of medicine at the University of North Carolina in Chapel Hill.

The horses have adapted to a place where fresh water and food are both in short supply. They've learned that if they dig deep enough, sometimes as deep as four feet, they'll find a few sips of fresh water.

It's a life where only the strong survive. John Funderburg, director of the North Carolina Museum of Natural History, says, "Over the years, there's been rather rigorous selection for those who could survive the heat, adapt to drinking brackish water and survive the greatest concentration of mosquitoes in the salt marsh world. The weak just don't survive under those conditions."

Now, after years of the horses making it on their own, some people think it's time to start managing the herds. At least two scientists think Shackleford Banks and Carrot Island may reach carrying capacity in the future. For others, managing the horses means an end to one of the few remaining examples of a free-ranging wild herd.

Local residents, most from Harkers Island, claim the horses, goats, sheep and cattle that roam Shackleford. Each year, around July Fourth, they round up the horses, pen them and brand the foals. The horses are a part of the heritage of the Outer Banks and a tradition some folks are afraid may be slipping away.

Sentiment has been aroused by recent talk of a National Park Service Plan to remove the animals from Shackleford Island and to leave a "representative herd" of horses.

But Preston "Mack" Riddel, superintendent of the Cape Lookout National Seashore offices, says it's premature to discuss the fate of the animals. The Park Service is in the process of purchasing Shackleford for inclusion in the Cape Lookout National Seashore. So far, though, only about 500 acres of the total 3,000 have been purchased.

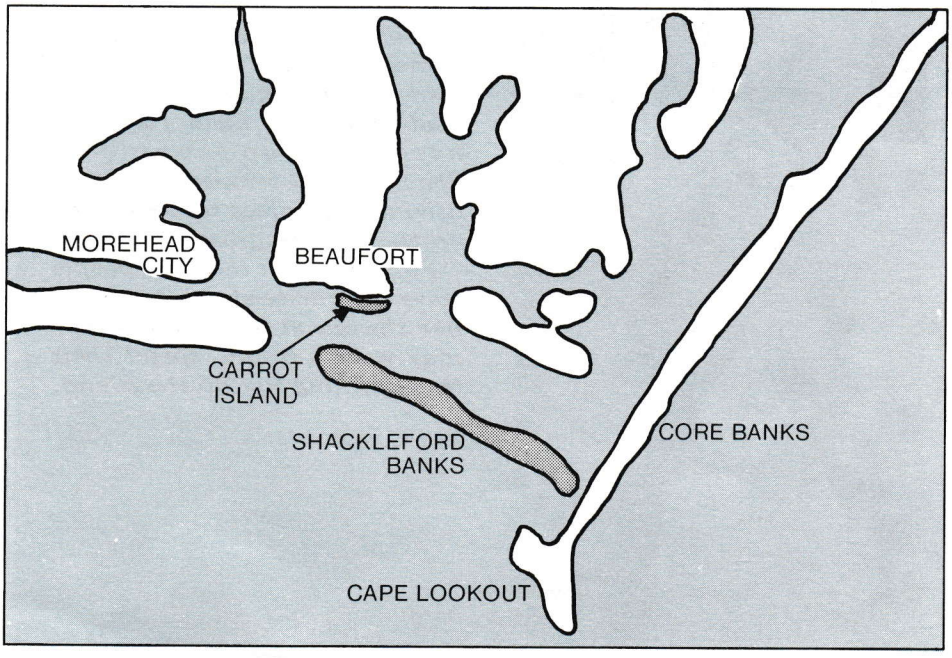
"From our studies thus far, it appears the goats, cows and sheep should be removed and a representative herd of horses should remain. But that could be a year, two years or even three years away. Many people think it's going to happen tomorrow and it's not," says Riddel.

One of the problems in setting policy for Shackleford once the purchase is complete will be that scientists disagree on how the island should be managed.

Gene Wood, wildlife ecologist at Clemson University's Belle W. Baruch Forest Science Institute, conducted a four-year study for the Park Service to determine the impact of the animals on the island. He concluded that if the number of animals continued to increase, they would practically denude the island of vegetation.

The sheep and goats are likely to cause the most damage to vegetation, he says. "Sheep, in winter months, will even dig out the roots of plants, completely destroying them so they can't grow the next season."

The goats mainly influence the maritime forest, keeping vegetation



Where the wild herds are—tiny Carrot, remote Shackleford

closely trimmed and nibbling bark off the trees. Without the goats, the forest wouldn't be penetrable by man, says Wood.

Cattle and horses graze mainly in the grasslands, with the cattle preferring the upland areas and the horses opting for the salt marshes when they are green.

To determine the impact the animals have on island vegetation, Wood set up exclosures to keep them from grazing on small one-tenth-acre areas. In enclosures in the marsh, he found that "the areas would produce substantial amounts of cordgrass if the animals weren't grazing."

Wood says his studies show that the animals should be removed from the island to avoid over-grazing. "But, because of the possible historical links of the horses, a lot of people will demand they be left on the island. If that is done, the number of horses that will be maintained must be matched by the island's ability to feed them."

Wood says his data suggest the horse herds are increasing by 15 percent each year. In a 1980 aerial survey, he counted 108 horses, 74 cows, 144 sheep and 65 goats. Since those are numbers of animals he actually saw, Wood estimates the populations are probably higher, particularly for the goats, which often graze in the forest.

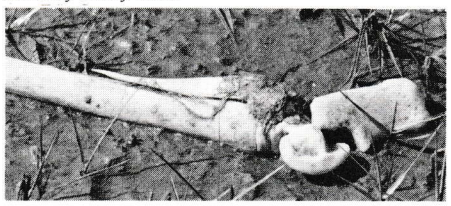
Rubenstein, who's been studying the horses for the past 10 years, disagrees with some of Wood's conclusions. He says, "The population maintains itself. They are not overgrazing the island." In the past 10 years, the horses have maintained a steady population of about 100, he says. He attributes the slight rise in the population in recent years to a few hard winters during the late 70s. Then the numbers were reduced to about 83 and the population has been recovering since then, not actually increasing, he says.

Rubenstein says that nature is doing an effective job of managing the horse population, without the help of man. He says the horses won't increase their numbers beyond what the island's resources can support.

Rubenstein says the horses are unique, that their value to science depends on their being left alone. Any management, he says, even so much as removing part of a horse herd from Shackleford, will destroy the natural scientific laboratory the island offers. "If they manage it, it's no laboratory."

Photo by Neil Caudle

Photo by Nancy Davis



Will banker horses eat themselves out of house and home? Scientists disagree. Studies using exclosures such as the one above showed grazing by all the animals was severe. At right, the remains of one horse that didn't make it.

But Wood predicts eventual overpopulation of the island, tremendous attrition in animal condition and mass starvation if the populations aren't managed. "In my opinion, letting nature take its course would be a serious mistake," Wood says.

Another scientist, Rolf Hoffman, predicts a similar doom for the horses on Carrot Island. As a Duke University graduate student in biology, Hoffman wrote, "The results . . . indicate that Bird Shoal-Carrot Island may reach its carrying capacity for large mammals in the foreseeable future." He recommends the state develop a management plan to avoid over-population, deteriorating health of the animals and the eventual destruction of their habitat.

The state recently purchased Carrot Island for inclusion in the N.C. National Estuarine Sanctuary.

According to Hoffman's figures, there were 24 horses on Carrot Island in 1977. By 1982, that number had grown to 50. Hoffman says that if that growth rate continues, the population would reach 80 by 1985, resulting in over-grazing of the island, an increased shortage of water and higher competition for good grazing areas. He proposed keeping the population to 50 horses by removing five to eight foals each year.

Bill McElyea of the Office of Coastal Management, says a management plan is being developed for Carrot Island. "We'd like to let the horses remain because they're a part of the aesthetics of Carrot Island. People in Beaufort have a strong attachment to Carrot Island and to the horses. We're going to encourage further research regarding the horse population," says McElyea.

But there may be a complication in the state's attempt to manage the horse population on Carrot Island. A Greensboro man says he owns the horses and would like to leave them there.

Whatever the fate of the horses on Shackleford Banks and Carrot Island, it is sure that they are both a tourist attraction and a sentimental tie to the past. Each weekend during the summer months, 83-year-old Grayden Paul boards a double-decker English sight-seeing bus and leads tourists through Beaufort. He points out the horses which roam Carrot Island across the water from Beaufort and says, "I was born and raised right here with those ponies."

—Nancy Davis

Slash Star and the harems of Shackleford

For the first four years of his life, the colt Slash Star has roamed the grassy swales and marshes of Shackleford Banks with the herd—the harem—of his father. Now it is time for him to leave and make his own way.

He gallops past the dunes, over the tough cordgrass, stopping once to paw the damp sand and sip fresh water as it collects in the hole. Soon he reaches the limit of his father's domain, a line marked only by a few low shrubs, some piles of dung. He crosses the border.

For several days he lingers there, grazing on the fringes of another stallion's territory. The stallion glares out through a shock of wiry mane; he herds his harem away from the intruder. Slash Star grows bolder, grazing nearer to the herd.

Suddenly, the stallion charges, head up, his flaxen mane waving like a banner. His ruddy coat is stiff with salt spray. His flanks are scarred. As he meets the colt they snort, wheel, lay back their ears and mark the ground with their scent. Soon their hooves are flying, the stallion rearing high to flail the air.

There is no clear winner. Slash Star is agile and exceptionally strong, but the older stallion has earned his place with skill and savvy. After several days of testing one another, the stallion holds his ground, but cannot run the colt away.

At last, they reach an understanding. Slash Star can stay, but only as the stallion's helper, an apprentice. He will have no mares of his own.

Things go smoothly for several months. Day after day, Slash Star charges out to help defend the harem's borders. Sometimes the fights are vicious; his bleeding jaws sting when he drinks in the salt marsh. The stallion fights too, but now he has more time to rest, to graze, to groom his herd. The colt is learning to fight.

One day, when the older stallion is away defending their border, Slash Star mates with one of the mares. When the stallion returns, he too mates with the mare, as if reclaiming her.

Slash Star has broken the pact, and he will again. Before very long, he and the harem leader will battle for control of the herd. The loser will be banished.

Photo by Neil Caudle

Stallion wearing the scars of battle

The story of Slash Star first appeared, not in the pages of romantic fiction, but in a scientific journal. The original account of his coming-of-age, written in the more objective and scholarly prose of a scientist writing for scientists, was the work of Daniel Rubenstein, a Princeton University biologist who specializes in behavioral ecology—the study of how animals' behavior relates to their environment.

For the past ten years, Rubenstein has spent much of his free time on Shackleford Banks, traipsing the sands and wading the marshes with his students, jotting notes about the wild ways of the 100 or so feral horses there. He knows them all, he says, by their markings and by the names he gives them—Big Red, Slash Star, Squiggle Face and JJ. And he calls the social order among Shackleford horses "unique."

"The horses there set up territories and defend them," Rubenstein says. "They don't do that anywhere else. Shackleford is a natural laboratory of animal behavior."

Each year since he first studied the island as a graduate student from Duke University, Rubenstein has watched the harem leaders defend their borders, which never shifted more than fifteen or twenty meters. Then, in 1980, the laboratory turned upside down. What happened on Shackleford was nothing short of revolution—the violent overthrow of a great social order.

"The harem leaders were getting older, and at the same time there was an increase in the number of bachelor males," Rubenstein says. "Some of the young turks took over, threw the old stallions out, and divided the mares up among them. Now there are no big harems and no territories, only small herds and overlapping ranges."

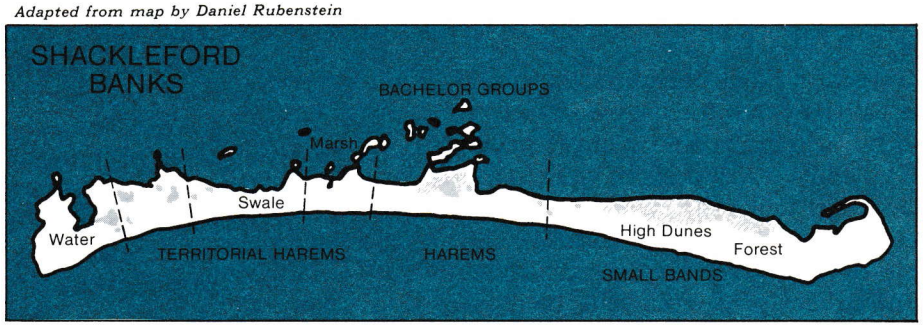
But Rubenstein expects to see the territories reassert themselves.

"My hypothesis is that the strongest of the stallions will begin to take mares away from the rest, and when it's economical, they'll set up the territories again."

Photo by Neil Caudle

Shackleford horses, like the three youngsters above, leave their natal herds when they are ready to breed. Map at right shows the island's social organization before the takeover of 1980. Four harem-masters kept territories in the grassy eastern end, while bachelor groups and two roving harems shared the island's center.

Adapted from map by Daniel Rubenstein



He thinks the territories came about because they served the interests of the herd. And Rubenstein has found that the quality of life in the territories is actually better in some ways than the life outside. He explains why by pointing to features in Shackleford's environment.

Shackleford is a narrow barrier island running west to east for about 10½ miles. On the eastern end, under the sweep of Cape Lookout's lighthouse beam, a broad, grassy swale rolls back from the dunes, pocked with holes containing rainwater, until it reaches the salt-marsh flats on the island's sound side. This eastern end is open, easy to patrol. Four herds made their home there, never leaving. Even when stampeded and driven away, the herds quickly re-settled their home turf. On many a stormy night, Rubenstein has watched them huddle together behind a dune or a fishing shack, unwilling to leave their territory, even for sheltering trees just a few miles away.

Why are the territories so important? Rubenstein believes that, by defending large areas of resources, a stallion can increase the size of his harem, secure better grazing sites for the females in his herd, and help ensure that he fathers more offspring.

Grass grew longer in the territories. Rubenstein has reported that the horses there seemed to discipline their grazing—cropping one area at a time, allowing new grass to establish itself.

But on Shackleford's western end, high dunes and maritime forest break the landscape into clumps of vegetation too small to manage or defend for the sake of a large herd. Here was a kind of netherland of bachelors, outcasts and lone mares, running in small bands, disbanding to form new groups, scuffling over

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a drink of water, a mouthful of grass. The weakest and the lowest-ranking drank last and least; many died. Only a few gained the strength and rank to challenge a harem master for his herd, or earned a place on the East End.

Between these regions lies a third, where Rubenstein found both the vegetation and the pattern of equine society in transition. Two herds shared the area, and their habits were like those of the wild mustangs in the Grand Canyon. Their ranges overlapped; they took turns at central watering holes.

"Growing up in animal societies is not an easy task," Rubenstein writes. It is a stark understatement, measured against the sun-bleached bones of a horse that died because it lacked the strength to pull itself out of the marsh mud. On Shackleford, no one intervenes in the process of natural selection. Aside from the July Fourth roundup, when families, many from Harkers island, brand a few foals and reclaim a largely symbolic ownership, people for the most part leave the horses alone. Sickness, injury and starvation trim the population to a hundred or so.

Rubenstein says that newborn colts have a 41 percent chance of living two years, the age by which most are weaned. Fillies face slightly better odds, probably because they are less rowdy and require less food.

Colts and fillies born into this world find it governed by the drive to survive, to leave offspring, but also by aggression and a strict protocol.

Typically, colts stay in their parents' herd until about age four, the age when most are ready to breed. Then they leave, some of their own accord, some because they are at last driven away.

Infrequently, a colt will be strong and smart enough to earn a place as helper in the herd of a neighboring stallion. Most often, he must first pay his dues among the bachelors and loners on the West End. If he arrives there strong and practiced at fighting, he may enter West End society with a rank near the middle, and survive to reproduce, either by taking a harem, or by sneaking into another stallion's herd to mate.

Rank is both a matter of seniority—the older bachelors often prevail—and power. Males win promotions with their teeth, their hooves, and also with the ferocity of their threats.

Fillies, which begin breeding around their third birthday, often leave their natal herd then and wander widely on the island before they settle on a harem, where they are usually welcome by the stallion, if not by the other mares. Rubenstein postulates that these relocations—among both males and females—help reduce inbreeding.

Photo by Neil Caudle

A Shackleford mare and her foal

In the harem, a filly is also assigned her rank, depending on her age and condition—adults ranking highest. Threats, headshakes and kicking help the top mares dominate their subordinates.

The top-ranking mares enjoy several privileges, especially in the territories. Rubenstein has shown that territorial stallions favor ranking females, both as mates and for what he calls "grooming." Horses groom one another by picking off bugs with their teeth, or cleaning matted manes and coats. They exercise more independence as well, since the stallion herds and harries them less frequently than those of lower status. Outside the territories, these privileges of rank were far less pronounced.

Since the revolution of '80, things just haven't been the same among the herds of Shackleford. Big Red, who once ruled a herd of 22 and the big territory on the island's eastern tip, lost his harem to an upstart. So did JJ, a stallion with a harem 18-strong. Now the herds are smaller—six or seven each, and the youngsters run the show.

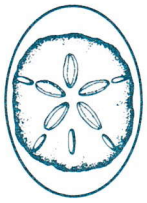
And what about the colt Slash Star? He lost that battle for the sorrel stallion's harem, some eight months after his arrival as apprentice.

And even though the territorial order has fallen, Rubenstein and his students will be back next year, and probably for years to come, watching to see if it rises again. With their stopwatches, recorders, cameras and notebooks, they will record the births, the deaths, the horseplay and the battles. They will feed all their facts into computers and print out the patterns and pecking-orders. In the laboratory of Shackleford, they are learning not only about horses, but about method—techniques that Rubenstein says will help them see how wild creatures of all kinds adapt to a harsh and unusual environment.

—Neil Caudle

THE BACK PAGE

"The Back Page" is an update on Sea Grant activities—on research, marine education and advisory services. It's also a good place to find out about meetings, workshops and new publications. For more information on any of the projects described, contact the Sea Grant offices in Raleigh (919/737-2454).



When it comes to fertilizing the land, it may be best to look to the sea. Hans Paerl, a Sea Grant researcher at the University of North Carolina Institute of Marine Sciences in Morehead City, has found that codium seaweed stimulates growth in plants.

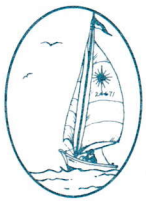
Codium grows thick in shellfish beds, often choking the bed's occupants. Paerl wanted to find a use for the nuisance seaweed, one that would make harvest economically feasible and control the seaweed's abundant growth.

Using agricultural methods in an oceanographic laboratory, Paerl set out to see how codium affected plant growth. Other seaweeds, such as sargassum, had been shown rich in plant hormones that stimulated growth. But tests indicated codium did not produce a high concentration of these hormones.

Trying another approach, Paerl tested codium as a soil conditioner for corn. He found that soil conditioned with codium yielded greater harvests than soil dressed with horse manure.

Paerl says the codium is best when dried, washed of excess salts and then applied during the fall months as a soil applicant.

Paerl says harvesting codium for use as a soil conditioner depends on three things: a willingness by fishermen to harvest the seaweed, the economic benefits of harvest and processing, and the acceptance of codium as a fertilizer in place of more traditional soil dressings such as manure.



Surf fishing, sailing, snorkeling and traveling are just a few of the activities planned for a summer workshop for young people. The 4-H Marine Environment Workshop will concentrate on marine resources, coastal ecology and marine-related careers. The workshop will include programs at the Bogue Banks Marine Resources Center, the Division of Marine Fisheries and the NCSU Seafood Lab.

The workshop will be held August 7-12 at Mitchell 4-H Camp in Swansboro. Registration is open to teens ages 14-18 and is not limited to 4-H members. The fee for the week-long workshop is $90 and the deadline for registration is July 1. Participants will be accepted on a first-come, first-serve basis and the workshop is limited to 40 students.

The workshop is one in a series of 4-H activities that have grown out of a Sea Grant project conducted in 1981 and 1982 to promote marine awareness.

For more information, contact Jaynee Medlicott, P.O. Box 5157, North Carolina State University, Raleigh, N.C. 27650 or call (919) 737-3243.

Battery Island, just across the Cape Fear River from Southport, is the site of the largest heronry in the state. And, each spring and summer, at least 4,000 pairs of herons make the island their home.

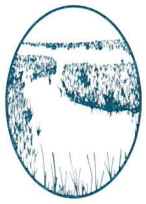
According to James Parnell, a biologist at UNC-Wilmington who has done Sea Grant research on waterbirds, "Many birds, in the process of nesting and raising their young, damage the habitat. Herons are like this. For example, they produce so much excrement that they actually over-fertilize the vegetation. They also just physically break a lot of it down."

For the past year, one of Parnell's students has studied the birds of Battery Island. He's trying to find ways to maintain the nesting site so the birds will return to the island year after year.

Parnell has received Sea Grant mini-grant funds to survey populations of nesting colonial waterbirds. In an earlier Sea Grant project, Parnell and Robert Soots, an associate investigator, developed a census methodology for calculating waterbird populations. They used the methodology to find out where and how many colonial waterbirds were nesting along the North Carolina coast. Now Parnell wants to check the waterbirds to see if populations and nesting sites have changed.

"Birds are an important barometer of the environment that should be monitored periodically," says Sea Grant Director B.J. Copeland.

Soots and Parnell's *Atlas of Colonial Waterbirds of North Carolina Estuaries*, written at the completion of their project, is available from UNC Sea Grant, Box 5001, Raleigh, N.C. 27650. The 274-page book costs $7. Ask for publication UNC-SG-78-10.



Larry Crowder, a North Carolina State University zoologist, has received mini-grant funds to study the predator-prey relationship among fishes in the estuary. Crowder, who recently joined the NCSU faculty, comes to North Carolina from Wisconsin, where he has just completed a three-year Wisconsin Sea Grant project.

Crowder will be sampling fish in Pamlico Sound's Rose Bay to establish predator diets and size. He plans to develop a predator-prey model for the area.

Continued on next page

Mini-grant funds have been awarded to John Maiolo, an East Carolina University sociologist, to develop a methodology to measure the growth and impact of recreational populations in five coastal counties: Hyde, Dare, Carteret, New Hanover and Brunswick. Information learned from the study will be useful to managers who allocate resources such as water supplies and recreational areas.

Maiolo will also take a hard look at how the housing growth that results from increased tourism affects shellfish closings.

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