



Occasionally a nurse shark would menace a blackfin, though the blackfins would not threaten them. One would suddenly turn sharply towards the offending blackfin as it passed and then circle, watching it. The blackfin would turn away and depart. It was surprising that the nurse sharks were more aggressive than the large-eyed, swift-swimming requiem sharks.

Discriminating tastes

They were also more adept at finding the choice morsels of food among the scraps I brought. These, they targeted and engulfed one after the other. They seemed to have no limit to the volume they could suck in.

When I threw a treat to a blackfin, often he or she did not notice, and it was pounced upon by one of the sluggish-looking nurse sharks the moment it hit the sand. Not only were they able to locate the food better, but they were paying attention and did it faster, too—their appearance of slothful indolence and stupidity was all show!

Klinotaxis vs tropotaxis

Nurse sharks are said to use *klinotaxis*, a method of following a scent which

The Underrated Nurse Shark

Text by Ila France Porcher

Plentiful nurse sharks attended the sessions I held during my shark study in Tahiti. They are heavily-built animals with large, graceful fins, a long, pennant tail, and small eyes. They forage on the sea floor for a variety of foods at night and sleep in grottos in the coral during the days. Though these unusual sharks typically lie around on the sea floor, they are also capable of clamoring. They use their pectoral fins like paws to prop themselves up, while searching out food higher in the coral labyrinths.

As darkness fell, a small nurse shark would appear, attach itself to a scrap, and rest there, its wide fins stirring, as it adjusted its position to feed. Soon, more would materialize from the dim surroundings and drift

in uneven circles. Plunking themselves on top of the shark food, they slowly munched and sometimes gyrated, while the blackfin sharks circled over them. It was common for there to be three sharks of more than three meters in length, five over two meters, and several between one and two meters long, each scraping and sucking out the contents of a fish head, wriggling and undulating about in clouds of sand and lagoon fish, spoiling the visibility.

The really large nurse sharks were as massive as draft horses, and they came later, as night fell. A pale, blimp-like form would appear off in the dimness, weaving in and out of view in slow motion as it floated through the coral, waving its improbable tail. It would waltz into the site, fins spread wide, pressing the water left, then right, as if to an unheard rhapsody, and, in a swirl of sand, it would settle upon the scraps.

Behaviors

Those sharks produced startling sounds of underwater thunder as they munched—daunting proof of the power of their

bites. Often, as one tried to extract some nourishment, he pushed the fish head forward until he got his head inside. Then he reared upwards until he stood on his tail. When several of them did so, with the fins of the fish heads curving outward above their pale bodies as they swayed slowly back and forth, the scene took on the appearance of a macabre dance.

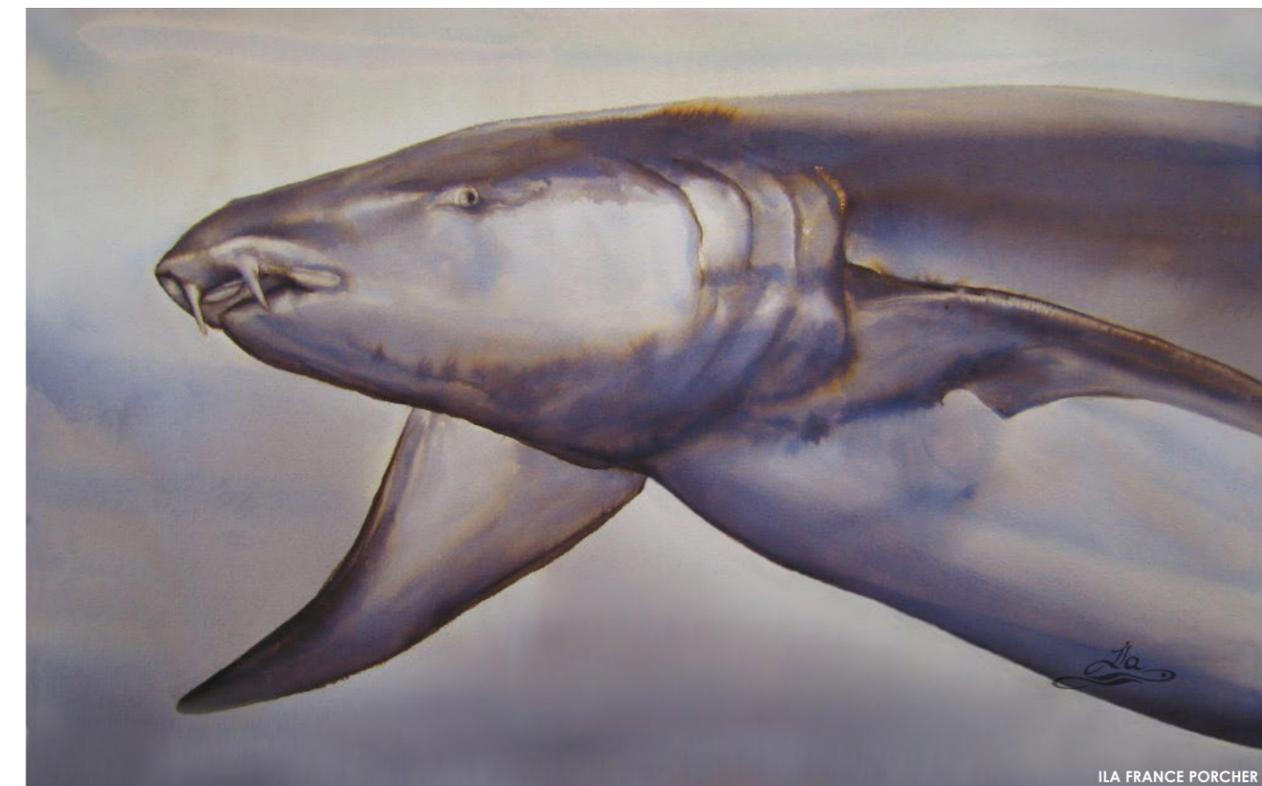
Nurse sharks trying to scrape food from the fish heads would rise vertically.

But usually there were not enough fish heads for each of them to have one, and several would go for the same one. As they undulated and pushed forward, their pale forms rose until their tails waved at the surface, forming a flower of nurse sharks, each one flailing its fins and flinging its enormous tail around for balance, while somehow their noses were all in the same fish head! The lack of aggression among them was striking.

Excitement but no aggression

Sometimes the blackfins became excited as the nurse sharks tore the fish heads apart, and circled them at about three meters distant, intermittently charging

in to try to get one. At times, a veritable tornado of blackfins circled the nurse sharks, moving fast and seeming highly excited, yet never was there any conflict among them.



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shark tales



Peek-a-boo. A curious nurse shark appears to investigate what a biped is doing out of his natural element. As inoffensive as nurse sharks may appear, they are ranked fourth in documented shark bites on humans, likely due to incautious behavior by divers on account of the nurse shark's slow, sedentary nature.

involves comparing odor concentrations to the right and left with each undulation, and turning towards the side on which the concentration of scent is strongest. This brings them directly and rapidly onto the source.

Blackfins, on the other hand, likely use *tropotaxis*, moving upstream towards a scent until it is no longer perceptible, then moving left and right until the stimulus is again perceived. The shark repeats the pattern until it finds the source of the odor.

This difference might partly explain why the nurse sharks were so much more apt

than the blackfins at finding the fish scraps I provided. Such food was not the blackfins' usual fare, and resembled more closely the sort of nourishment that nurse sharks might locate. Yet, the nurse sharks were also more alert in noticing that there was something to find!

When I brought a second person with me, no nurse sharks appeared, even during the periods in which they were so numerous at the sessions that they carpeted the site. Could it have been because they knew me and not the other person?

That two people were too many, but one was all right? It was another unsolved mystery that these languid sharks were so fussy about the presence of a second person that they would forgo the prospect of an easy meal and remain invisible unless I was alone.

Following behavior

One of the largest was an unusual individual. He appeared in a barren region where I began to hold the occasional feeding session while the blackfins were being fished. Sharks who ranged on both sides of the area visited, so there I could keep track of more of them in the effort to learn which ones were still alive, and if any more had appeared with injuries or hooks.

The unusual nurse shark began following me one eve-

ning while I roamed from one blackfin to another, checking for hooks and injuries. Every time I turned around, he would be coming along about two meters behind. For 15 or 20 minutes he followed, and when I left, he came with me to the surface. As I held the kayak prior to getting in, he drifted by in slow-motion, with just a few centimeters between us.

The biggest nurse sharks had always been the most cautious and shy. They arrived as darkness was falling and withdrew if I moved around, to float gracefully back later. Never had a nurse shark, or any shark, followed me persistently in this way over a long period of time. Many sharks expressed curiosity, but this relent-

less, slow and peaceful following behavior was new.

At the next session he came again as night fell. I was diving repeatedly to see the extent of damage to the jaw of a young blackfin who had been fished and escaped near death. So I became aware of his following me slowly, as if he was avoiding being seen. Two other big nurse sharks who were present avoided me as I swam around, and when I moved very much, they vanished and returned later, which was their normal behavior.

This time the unusual shark was following about a meter behind, and when his face approached my right arm, I tried an evasive movement and doubled back

past him. He flexibly turned with me at the same snail's pace to resume his position in my wake.

As I saw the absolute dedication with which he was following my every motion, I became alarmed. I was quite far from my kayak, and, without changing my swimming movements, drifted towards it then flew into it like a dolphin. The huge shark moved on, just under the boat, his wings undulating around him.

To follow me steadily for so long during each of the two sessions seemed extraordinary for such a large individual of a species with a preference for lying languidly munching on the lagoon's floor. Further, he had not appeared at



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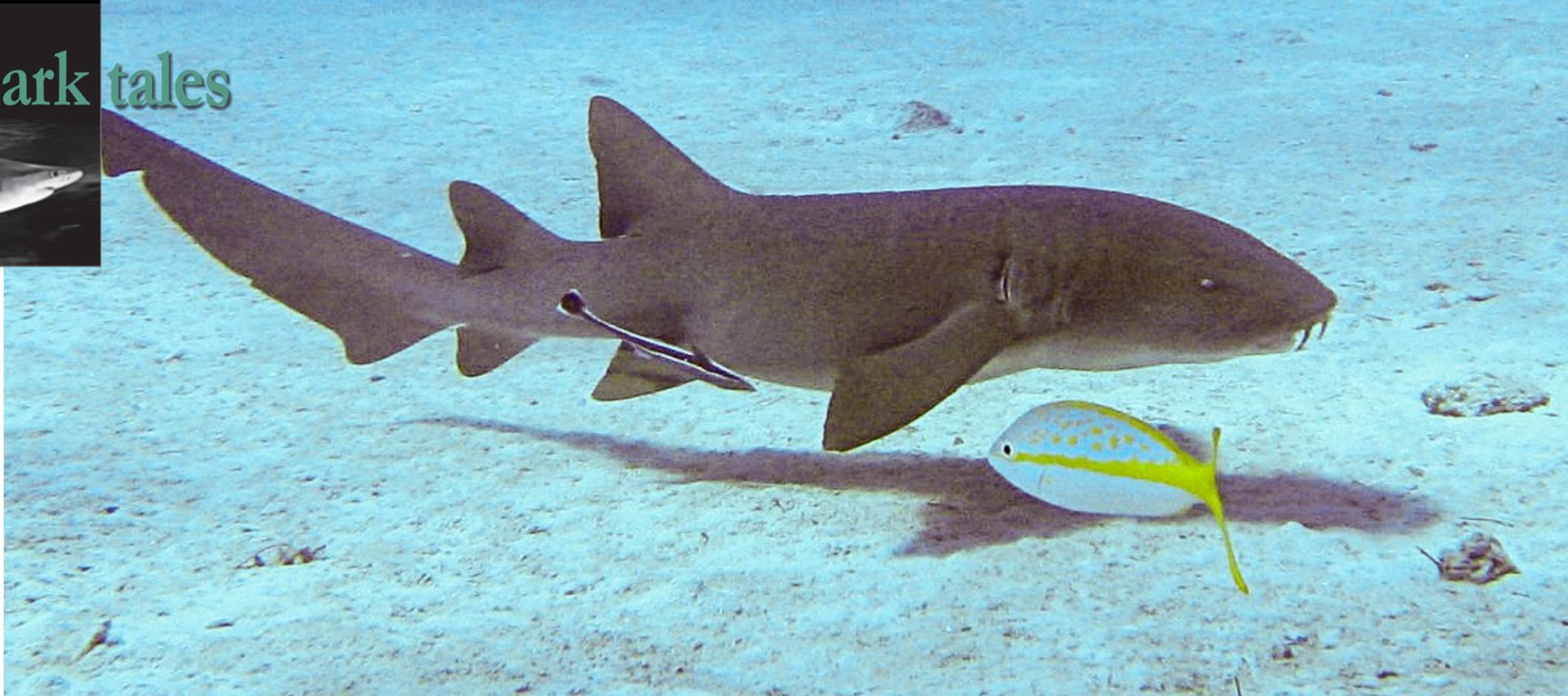
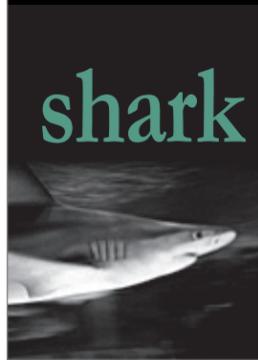
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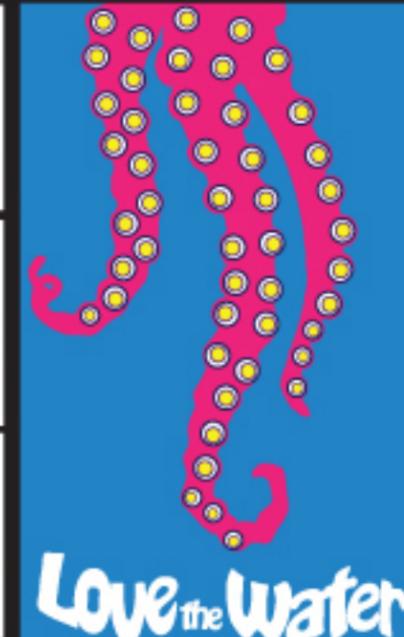
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an intervening session when a colleague had been with me.

Poor sight or interesting scent?

Arthur Myrberg, a shark ethologist with whom I discussed the situation, noted that the shark was keeping his distance from me for some reason—he could easily have come right up to me, yet he had not. He speculated that there could be something wrong with him, and suggested that if he could not see well, he would be unable to count on his vision to maintain a safe distance from objects. After sunset, vision by diurnal animals—those who are adapted to the dim light of dawn and dusk—becomes poorer.

However, Myrberg said that he had never encountered such behavior and felt that the situation was dangerous since, he told me, large nurse sharks will bite and not let go. The shark's attention to me, he pointed out, suggested that I was trailing a scent.

Yet, by then I had been observing sharks for many years and none of my scents, including blood, had ever interested any shark of any species. That no

other had behaved this way, suggested that the motive concerned this individual and no others.

When I returned to examine the situation more closely, I washed myself and all of my gear with unscented soap to take care of the "interesting scent" theory. But the unusual nurse shark did not appear again for several weeks, while passing storms brought poor conditions.

An unusual individual

Then, one evening I was returning to the feeding site after accompanying one of the blackfins, when a familiar shape swept into position behind me. The huge nurse shark followed within a meter, and when I held onto my kayak and remained there unmoving, he circled away, then accelerated to charge one of the other big nurse sharks who was lying by the food, munching. He chased him out!

I had never seen a nurse shark chase another, and his behavior did not fit in with the theory of his being blind. Here was an unusual case of aggression between two sharks of the same species!

As I watched from the kayak, from time to time, he glided away from the scraps and drifted slowly around me, but he was less interested in me when I remained still. Apparently, it was when I was moving around that he was stirred to follow.

He seemed more active than the other nurse sharks. He was constantly moving and changing position, and trailed another of the large nurse sharks nose to tail for awhile. He did not look handicapped—he seemed to be in excellent shape to be so active.

I concluded that he was simply an unusual individual.

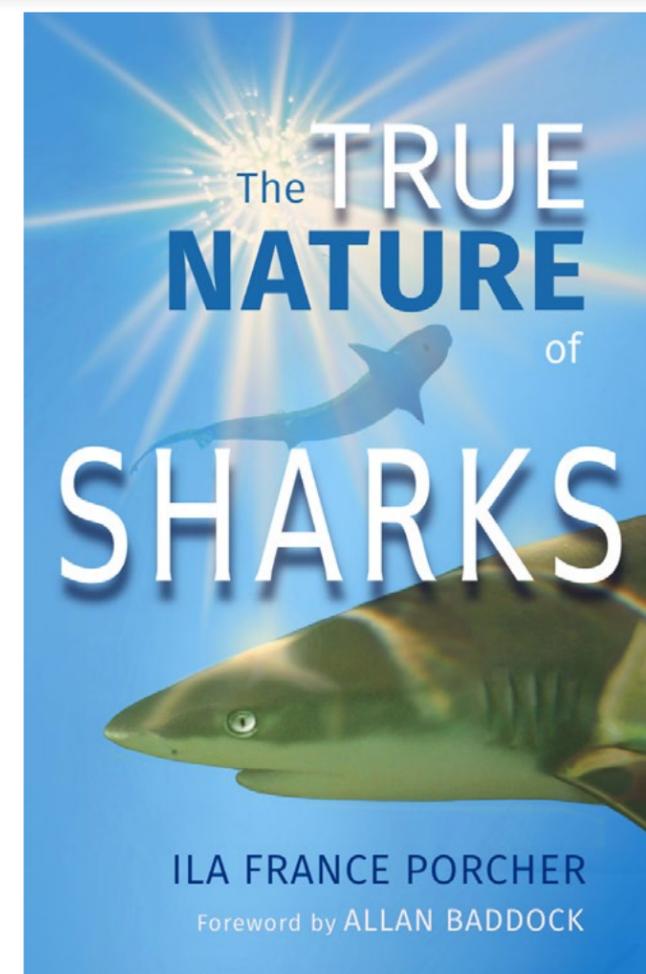
Territorial behavior

Another of the very large nurse sharks took to monopolizing the fish scraps one wet season when few were available. Usually there were some fish heads and spines lying on the sand for the nurse sharks, and when there were not, they undulated around looking for them and could be unexpectedly energetic. During a series of such sessions, this enormous shark would systematically try to pick

up every scrap, and put it in the place where he was lying. If I handed the blackfins a last spine, they would carry it around the area, taking bites and passing it from one to the other, but as soon as they dropped it, as they inevitably did, this nurse shark would land on it.

This possessive behavior was reminiscent of territoriality, but the way only one individual displayed it suggested that the shark's actions were the result of intelligent competition for food in an unusual situation, and not an example of territorial behavior. Though some sharks are known to have home ranges, these are not defended as territories are, and territoriality among them is unknown. ■

Ila France Porcher, author of The Shark Sessions and The True Nature of Sharks, is an ethologist who focused on the study of reef sharks after she moved to Tahiti in 1995. Her observations, which are the first of their kind, have yielded valuable details about their lives, including their reproductive cycle, social biology, population structure, daily behavior patterns, roaming tendencies and cognitive abilities.



The TRUE NATURE of

SHARKS

ILA FRANCE PORCHER

Foreword by ALLAN BADDOCK



When sharks get *sneaky*

You never see the shark that bites you, the saying goes. Sharks comprehend body orientation and therefore know whether humans are facing them or not, when they select an approach pattern when interacting with humans.

Though different species vary—and it varies a lot from individual to individual, as sharks do not have stereotyped behaviour—sharks that are openly curious tend to approach from the front, usually passing just within visual range initially. Those

that chose to attack their prey prefer to do so from prey's blind side.

Out of sight

In their two papers "Are Caribbean reef sharks, *Carcharhinus perezii*, able to perceive human body orientation?" (2013) and "A study of shark stealth behavior in the proximity of divers" (2015), Erich Ritter of the Shark Research Institute and Raid Amin of the University of West Florida investigated how sharks would approach typical prey, as well as humans, and found that these predatory fish prefer to avoid the field of vision. In other words, a shark would tend to approach a person from behind.

A test was designed to evaluate if sharks—in this case study, Caribbean reef shark (*Carcharhinus perezii*), which are normally shy or indifferent to the presence of divers—exhibited any measurable preference based on body orientation when approaching a person, and if they choose a certain swim pattern when close to a human being. The researchers found that when approaching a single test subject, significantly more sharks preferred to swim outside the person's field of vision.

"Our discovery that a shark can differentiate between the field of vision and

Caribbean reef sharks can tell if a human is facing towards them.



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non-field of vision of a human being, or comprehend human body orientation, raises intriguing questions not only about shark behavior, but also about the mental capacity of sharks," said Ritter.

Keeping their distance

In addition to determining the general direction of its approach, a shark also chooses a minimal approach distance, at which it turns away from the diver. This minimal approach distance likely indicates some kind of a personal sphere.

This space has previously been described as the shark's *idiosphere*, or inner circle, and ranges between one and two body lengths. About half the sharks swam farther than one mile off the sea floor when approaching the test subjects. However, larger sharks preferred to remain closer to the bottom than smaller sharks, regardless of whether they moved in from the front or the back of a test subject. ■
SOURCES: ANIMAL COGNITION (2013), OPEN JOURNAL OF ANIMAL SCIENCES (2015)

"Look at that weird creature!" A pair of sharks—in this case, a lemon shark (*Negaprion brevirostris*) on the left and a Caribbean reef shark (*Carcharhinus perezii*) on the right—appear to be watching and trailing an unsuspecting diver, together.



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