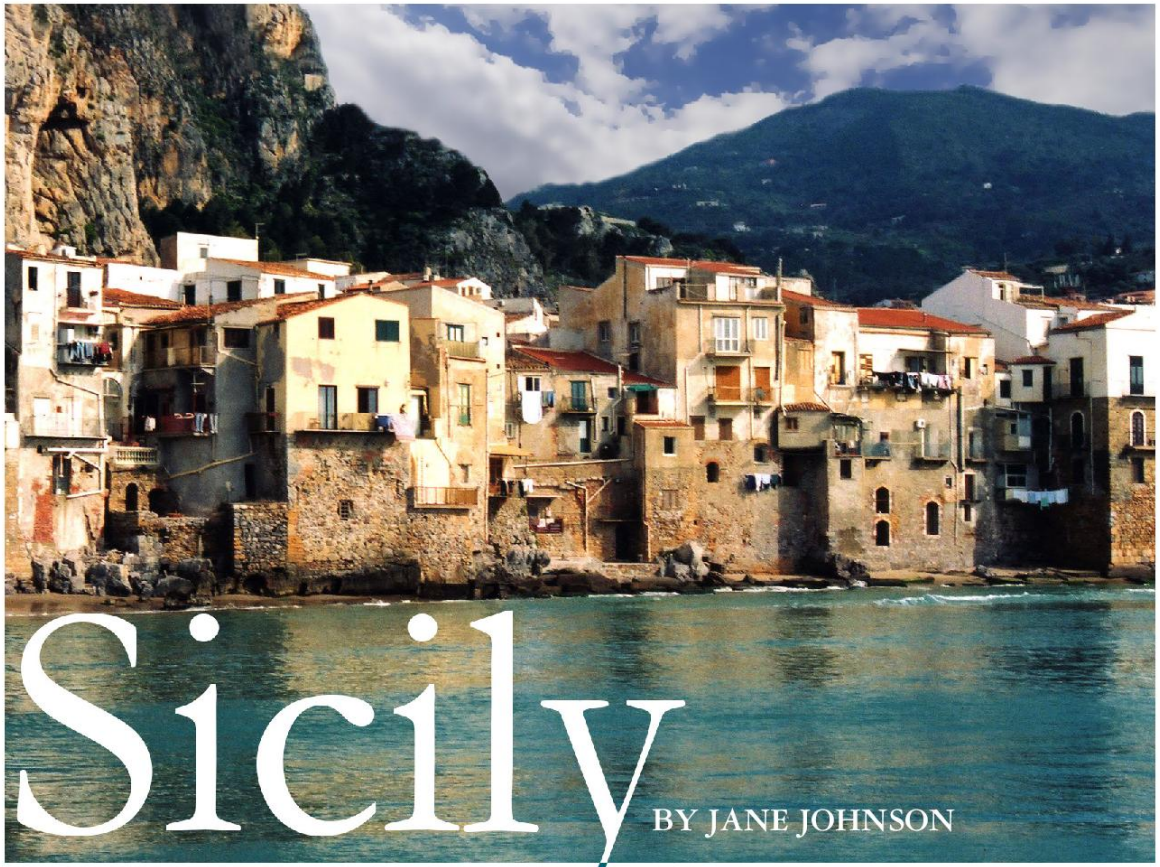


Sicily

BY JANE JOHNSON

I have hit---herto sometimes spoken as if the variations—so common and multiform with organic beings under domestication, and in a lesser degree with those under nature—were due to chance. This, of course is a wholly incorrect expression, but it serves to acknowledge plainly our ignorance of the cause of each particular variation. Some authors believe it to be as much the function of the reproductive system to produce individual differences, or slight deviations of structure, as to make the child like its parents. But the fact of variations and monstrosities occurring much more frequently under domestication than under nature, and the greater variability of species having wide ranges than of those with restricted ranges, lead to the conclusion that variability is generally related to the conditions of life to which each species has been exposed during several successive generations. In the first chapter I attempted to show that changed conditions act in two ways, directly on the whole organisation or on certain parts alone, and indirectly through the reproductive system. In all cases there are two factors, the nature of the organism, which is much the most important of the two, and the nature of the conditions. The direct action of changed conditions leads to definite or indefinite results. In the latter case the organisation seems to become plastic,

B E F O R E

applying the principles arrived at in the last chapter to organic beings in a state of nature, we must briefly discuss whether these latter are subject to any variation. To treat this subject properly, a long catalogue of dry facts ought to be given; but these I shall reserve for a future work. Nor shall I here discuss the various definitions which have been given of the term species. No one definition has satisfied all naturalists; yet every naturalist knows vaguely what he means when he speaks of a species. Generally the term includes the unknown element of a distinct act of creation. The term "variety" is almost equally difficult to define; but here community of descent is almost universally implied, though it can rarely be proved. We have also what are called monstrosities; but they graduate into varieties. By a monstrosity I presume is meant some considerable deviation of structure, generally injurious, or not useful to the species. Some authors use the term "variation" in a technical sense, as implying a modification directly due to the physical conditions of life; and "variations" in this sense are supposed not to be inherited; but who can say that the dwarfed condition of shells in the brackish waters of the Baltic, or dwarfed plants on Alpine summits, or the thicker fur of an animal from far northwards, would not in some cases be inherited for at least a few generations? And in this case I presume that the form would be called a variety.

"It is notoriously difficult to breed nearly perfect birds, many departing widely from the standard."

– CHARLES DARWIN

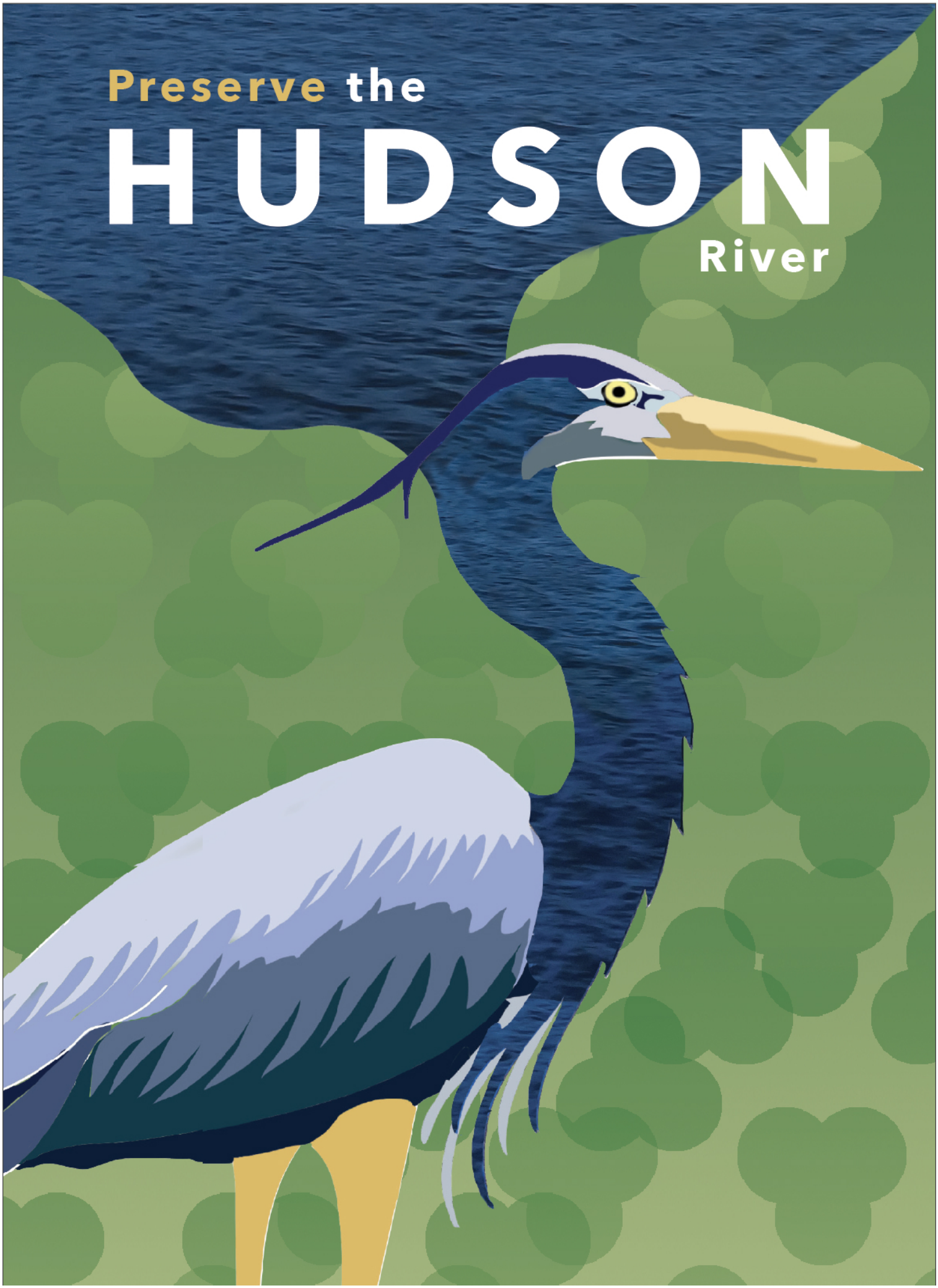
in which species present an inordinate amount of variation. With respect to many of these forms, hardly two naturalists agree whether to rank them as species or as varieties. We may instance Rubus, Rosa, and Hieracium among plants, several genera of insects, and of Brachiopod shells. In most polymorphic genera some of the species have fixed and definite characters. Genera which are polymorphic in one country seem to be, with a few exceptions, polymorphic in other countries, and likewise, judging from Brachiopod shells, at former periods of time. These facts are very perplexing, for they seem to show that this kind of variability is independent of the conditions of life. I am inclined to wsuspect that we see, at least in some of these polymorphic genera, variations which are of no service or disservice to the species, and which consequently have not been seized on and rendered definite by natural selection, as hereafter to be explained. Individuals of the same species often present, as is known to every one, great differences of structure, independently of variation, as in the two sexes of various animals, in the two or three castes of sterile females or workers among insects, and in the immature and larval states of many of the lower animals. There are, also, cases of dimorphism and I am inclined to wsuspect that we see, at least in some of these polymorphic genera, variations

Don't look like a tourist...

Instincts comparable with habits, but different in their origin—Instincts graduated—Aphides and ants—Instincts variable—Domestic instincts, their origin—Natural instincts of the cuckoo, molothrus, ostrich, and parasitic bees—Slave-making ants—Hive-bee, its cell-making instinct—Changes of instinct and structure not necessarily simultaneous—Difficulties of the theory of the Natural Selection of instincts—Neuter or sterile insects—Summary.

Many instincts are so wonderful that their development will probably appear to the reader a difficulty sufficient to overthrow my whole theory. I may here premise, that I have nothing to do with the origin of the mental powers, any more than I have with that of life itself. We are concerned only with the diversities of instinct and of the other mental faculties in animals of the same class. I will not attempt any definition of instinct. It would be easy to show that several distinct mental actions are commonly embraced by this term; but every one understands what is meant, when it is said that instinct impels the cuckoo to migrate and to lay her eggs in other birds' nests. An action, which we ourselves require experience to enable us to perform, when performed by an animal, more especially by a very young one, without experience, and when performed by many individuals in the same way, without their knowing for what purpose it is performed, is usually said to be instinctive. But I could show that none of these characters are universal. A little dose of judgment or reason, as Pierre Huber expresses it, often comes into play, even with animals low in the scale of nature. Frederick Cuvier and several of the older metaphysicians have compared instinct with habit. This comparison gives, I think, an accurate notion of the frame of mind under which an instinctive action is performed, but not necessarily of its origin. How unconsciously many habitual actions are performed, indeed not rarely in direct opposition to our conscious will! yet they may be modified by the will or reason. Habits easily become associated with other habits, with certain periods of time and states of the body. When once acquired, they often remain constant throughout life. Several other points of resemblance between instincts and habits could be pointed out. As in repeating a well-known song, so in instincts, one action follows another by a sort of rhythm; if a person be interrupted in a song, or in repeating anything by rote, he is generally forced to go back to recover the habitual train of thought: so P. Huber found it was with a caterpillar, which makes a very complicated hammock; for if he took a caterpillar which had completed its hammock up to, say, the sixth stage of construction, and put it into a hammock completed up only to the third stage, the caterpillar simply re-performed the fourth, fifth, and sixth stages of construction. If, however, a caterpillar were taken out of a hammock made up, for instance, to the third stage, and were put into one finished up to the sixth stage, so that much of its work was already done for it, far from deriving any benefit from this, it was much embarrassed, and, in order to complete its hammock, seemed forced to start from the third stage, where it had left off, and thus tried to complete the already finished work. The principle discussed under the last heading may be applied to our present subject. It is notorious that specific characters are more variable than generic. To explain by a simple example what is meant: if in a large genus of plants some species had blue flowers and some had red, the colour would be only a specific character, and no one would be surprised at one of the blue species varying into red, or conversely; but if all the species had blue flowers, the colour would become a generic character, and its variation would be a more unusual circumstance. I have chosen this example because the explanation which most naturalists would advance is not here applicable, namely, that specific characters are more variable than generic, because they are taken from parts of less physiological importance than those common-

> "If the misery of the poor be caused not by the laws of nature, but by our institutions, great is our sin."


Preserve the
HUDSON
River

DON'T LOOK LIKE A TOURIST!

JURASSIC COAST

BY JANE JOHNSON

IN THE CIRCLE: A large concretion of Acanthoceratid ammonites found on the Jurassic coast. BACKGROUND: The Durdle Door, a large, naturally-weathering limestone arch in the seaward progression of the Jurassic coast rock formation. OPPOSITE: The first-known plesiosaur skeleton, discovered by illustrtious paleontologist Mary Anning in 1830.

Distinction between the sterility of first crosses and of hybrids—Sterility various in degree, not universal, affected by close interbreeding, removed by domestication—Laws governing the sterility of hybrids—Sterility not a special endowment, but incidental on other differences, not accumulated by natural selection – Causes of the sterility of first crosses and of hybrids—Parallelism between the effects of changed conditions of life and of crossing—Dimorphism and trimorphism — Fertility of varieties when crossed and of their mongrel offspring not universal—Hybrids and mongrels compared independently of their fertility—Summary.

The view commonly entertained by naturalists is that species, when intercrossed, have been specially endowed with sterility, in order to prevent their confusion. This view certainly seems at first highly probable, for species living together could hardly have been kept distinct had they been capable of freely crossing. The subject is in many ways important for us, more especially as the sterility of species when first crossed, and that of their hybrid offspring, cannot have been acquired, as I shall show, by the preservation of successive profitable degrees of sterility. It is an incidental result of differences in the reproductive systems of the parent-species. In treating this subject, two classes of facts, to a large extent fundamentally different, have generally been confounded; namely, the sterility of species when first crossed, and the sterility of the hybrids produced from them.

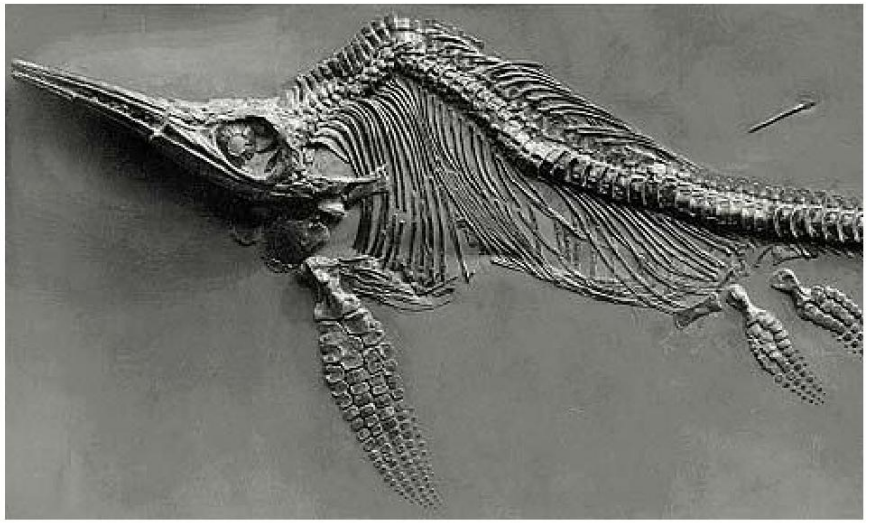
Pure species have of course their organs of reproduction in a perfect condition, yet when intercrossed they produce either few or no offspring. Hybrids, on the other hand, have their reproductive organs functionally impotent, as may be clearly seen in the state of the male element in both plants and animals; though the formative organs themselves are perfect in structure, as far as the microscope reveals. In the first case the two sexual elements which go to form the embryo are perfect; in the second case they are either not at all developed, or are imperfectly developed. This distinction is important, when the cause of the sterility, which is common to the two cases, has to be considered. The distinction probably has been slurred over, owing to the sterility in both cases being looked on as a special endowment, beyond the province of our reasoning powers.

The fertility of varieties, that is of the forms known or believed to be descended from common parents, when crossed, and likewise the fertility of their mongrel offspring, is, with reference to my theory, of equal importance with the sterility of species; for it seems to make a broad and clear distinction between varieties and species.

DEGREES OF STERILITY.

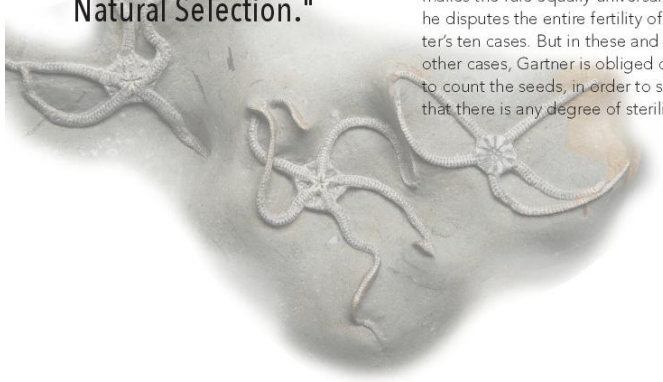
First, for the sterility of species when crossed and of their hybrid offspring. It is impossible to study the sever-

HOOKEN CLIFF: The highly weathered limestone in the Hooken landslide makes for easy fossil hunting. These cliff faces are composed almost purely of carbonate material from ancient marine organisms, as evidenced by their white color.



Right: the prodigious ichthyosar discovery made in 1810 by illustrtious paleontologist Mary Anning, then aged twelve. Anning was born into an impoverished family and due to her gender in the nineteenth century, she was prevented from entry into the Geological Society of London. Nevertheless, she persisted, and is regarded as one of the pre-eminent paleontologists of all time.

"I have called this principle, by which, each slight variation, if useful, is preserved, by the term of Natural Selection."



al memoirs and works of those two conscientious and admirable observers, Kolreuter and Gartner, who almost devoted their lives to this subject, without being deeply impressed with the high generality of some degree of sterility. Kolreuter makes the rule universal; but then he cuts the knot, for in ten cases in which he found two forms, considered by most authors as distinct species, quite fertile together, he unhesitatingly ranks them as varieties. Gartner, also, makes the rule equally universal; and he disputes the entire fertility of Kolreuter's ten cases. But in these and in many other cases, Gartner is obliged carefully to count the seeds, in order to show that there is any degree of sterility. He always compares the maximum number of seeds produced by two species when first crossed, and the maximum produced by their hybrid offspring, with the average number produced by both pure parent-species in a state of nature. But causes of serious error here intervene: a plant, to be hybridised, must be castrated, and, what is often more important, must be secluded in order to prevent pollen being brought to it by insects from other plants. Nearly all the plants experimented on by Gartner were potted, and were kept in a chamber in his house. That these processes are often injurious to the fertility of a plant cannot be doubted; for Gartner gives in his table about a score of cases of plants which he castrated, and artificially fertilised with their own pollen, and (excluding all cases such as the Leguminosae, in which there is an acknowledged difficulty in the manipulation) half of these twenty plants had their fertility in some degree impaired. Moreover, as Gartner repeatedly crossed some forms, such as the common red and blue pimpernels (Anagallis arvensis and

na · no · plas · tic

the weathered plastic debris with a particle size under **100 nanometers**. Remain suspended in water column until **consumed by marine plankton**, and then work their way up the food chain, **even into seafood**.

WHAT IS PHOTODEGREDATION?

Sunlight breaks apart plastic pollution into smaller and smaller particles that **never go away**. Ever.

straws

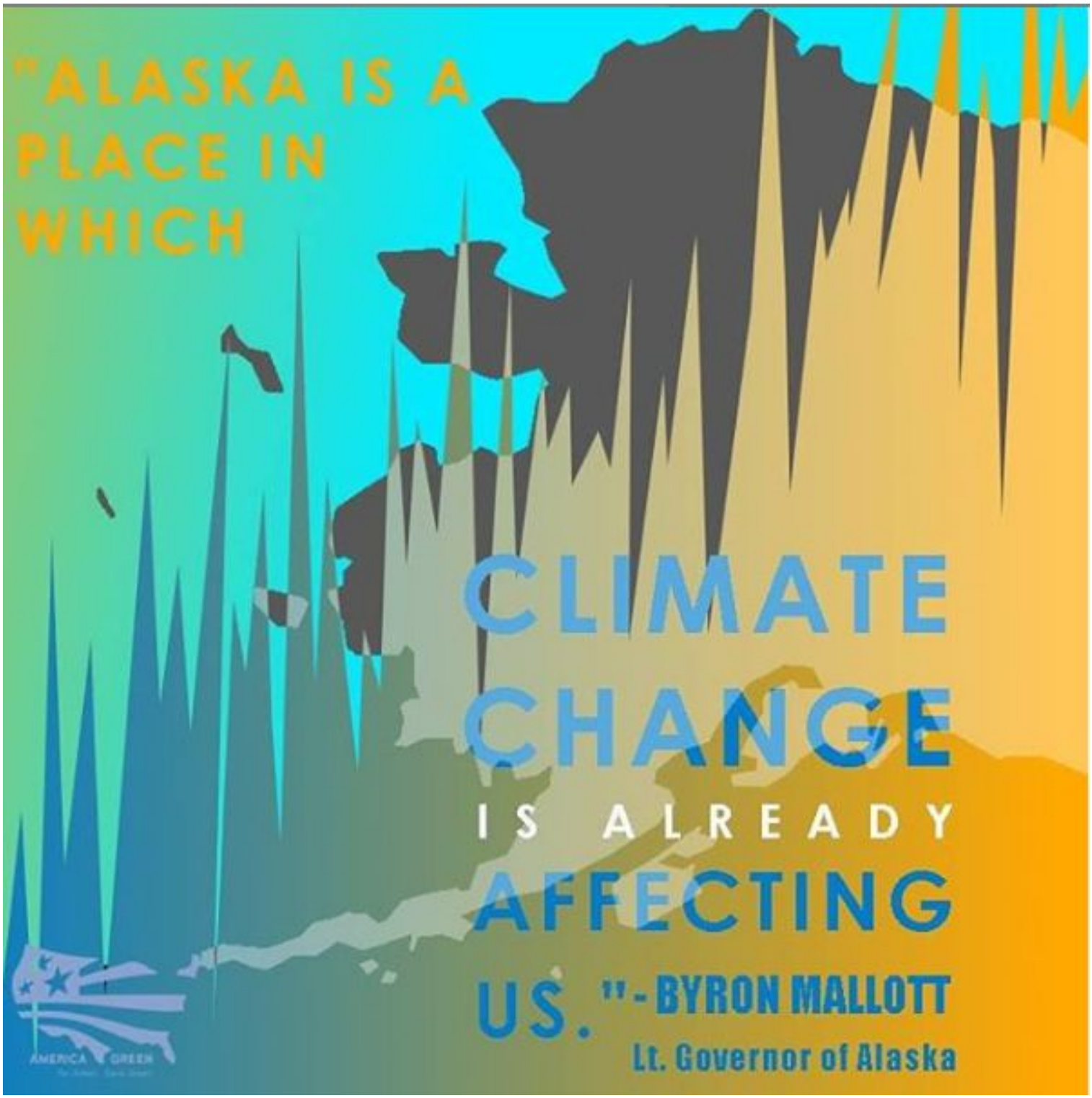
No. 1 culprit of ocean plastic.

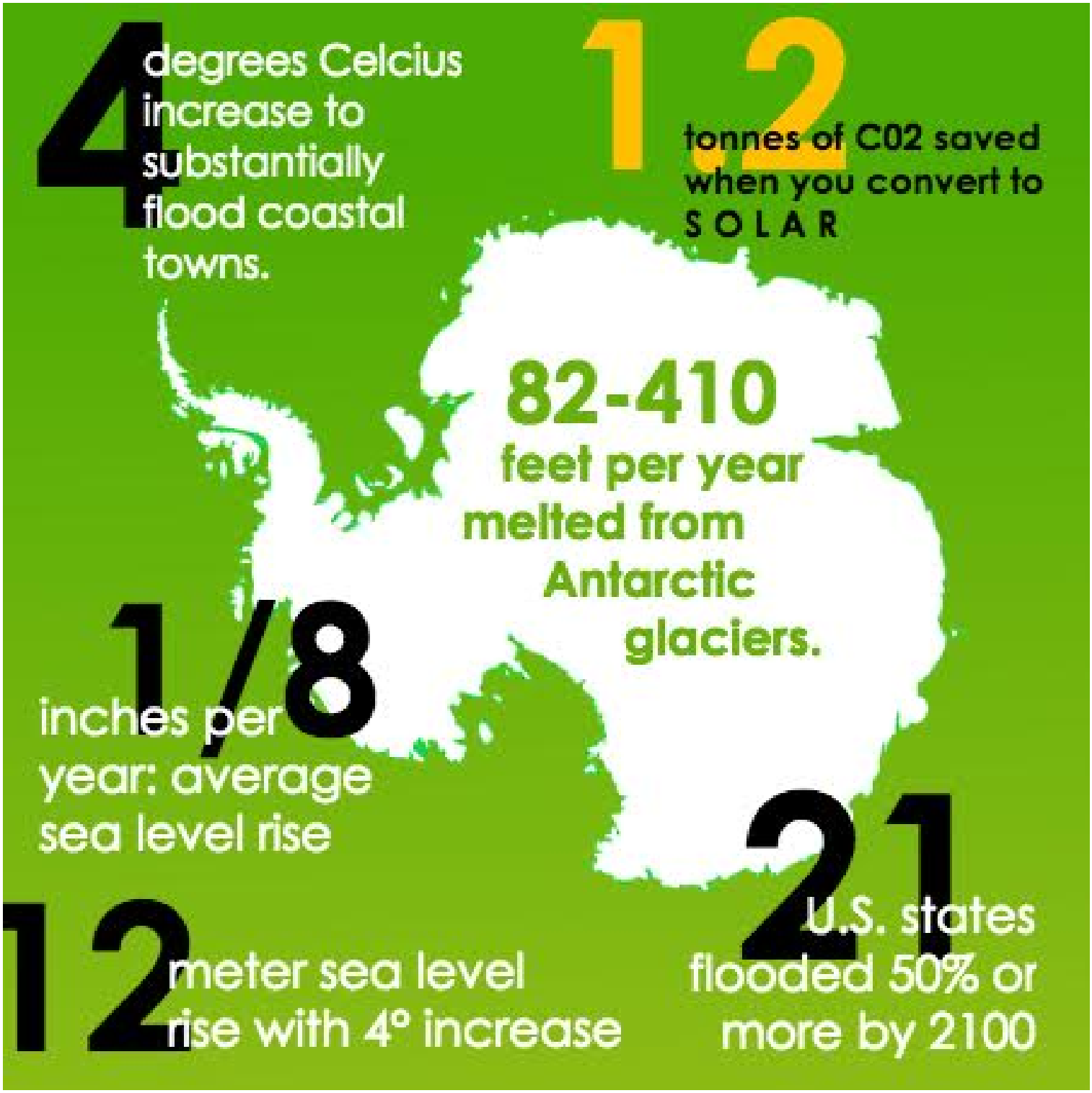
In 2017,

research showed that microplastics that ascended the food web caused **measueable brain damage**, adversely impacting their hunting instincts.

Is anyone really comfortable with this?


"IF THE BEE DISAPPEARED FROM THE SURFACE OF THE GLOBE, THEN MAN WOULD ONLY HAVE FOUR YEARS OF LIFE LEFT."
-ATTRIBUTED TO ALBERT EINSTEIN
Bees are not colonizing fast enough to escape climate change.
Go green today:
AmericaGreenSolar.com


"ALASKA IS A PLACE IN WHICH
CLIMATE CHANGE IS ALREADY AFFECTING US."
- BYRON MALLOTT
Lt. Governor of Alaska
AMERICA GREEN


4
degrees Celcius increase to substantially flood coastal towns.
1.2
tonnes of C02 saved when you convert to SOLAR
82-410
feet per year melted from Antarctic glaciers.
1/8
inches per year: average sea level rise
12
meter sea level rise with 4° increase
21
U.S. states flooded 50% or more by 2100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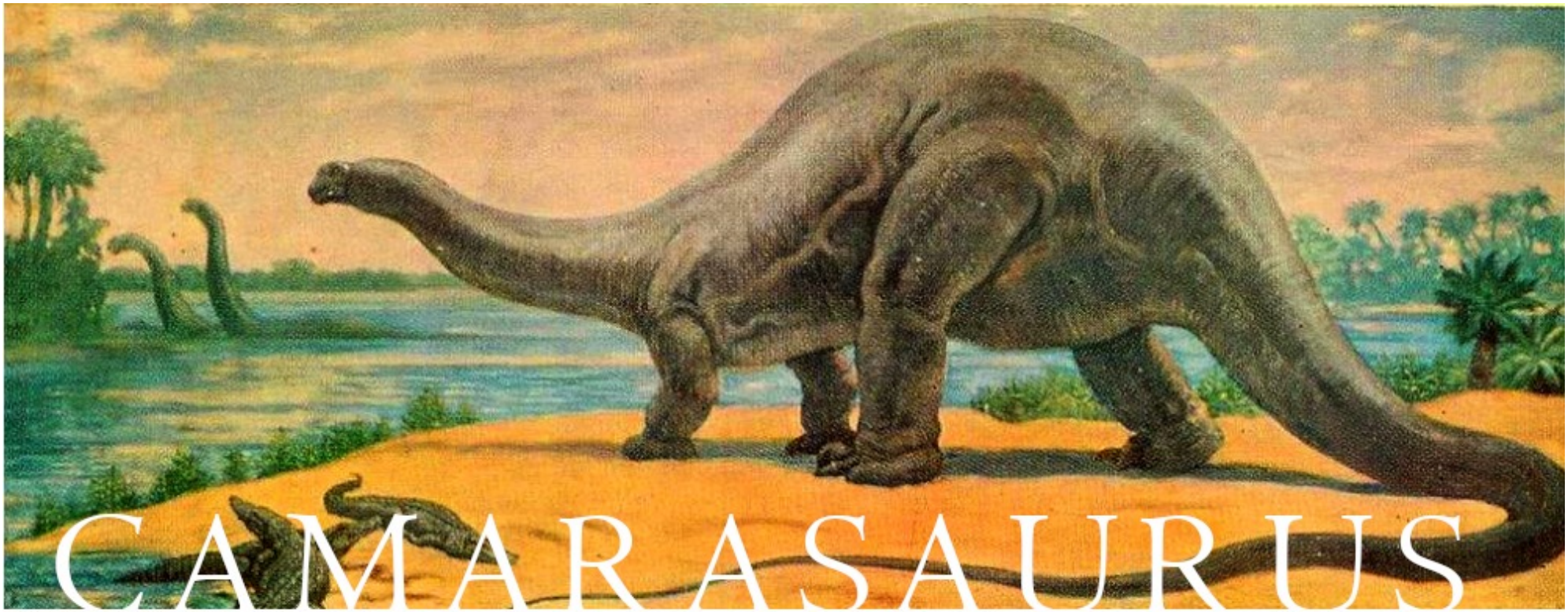
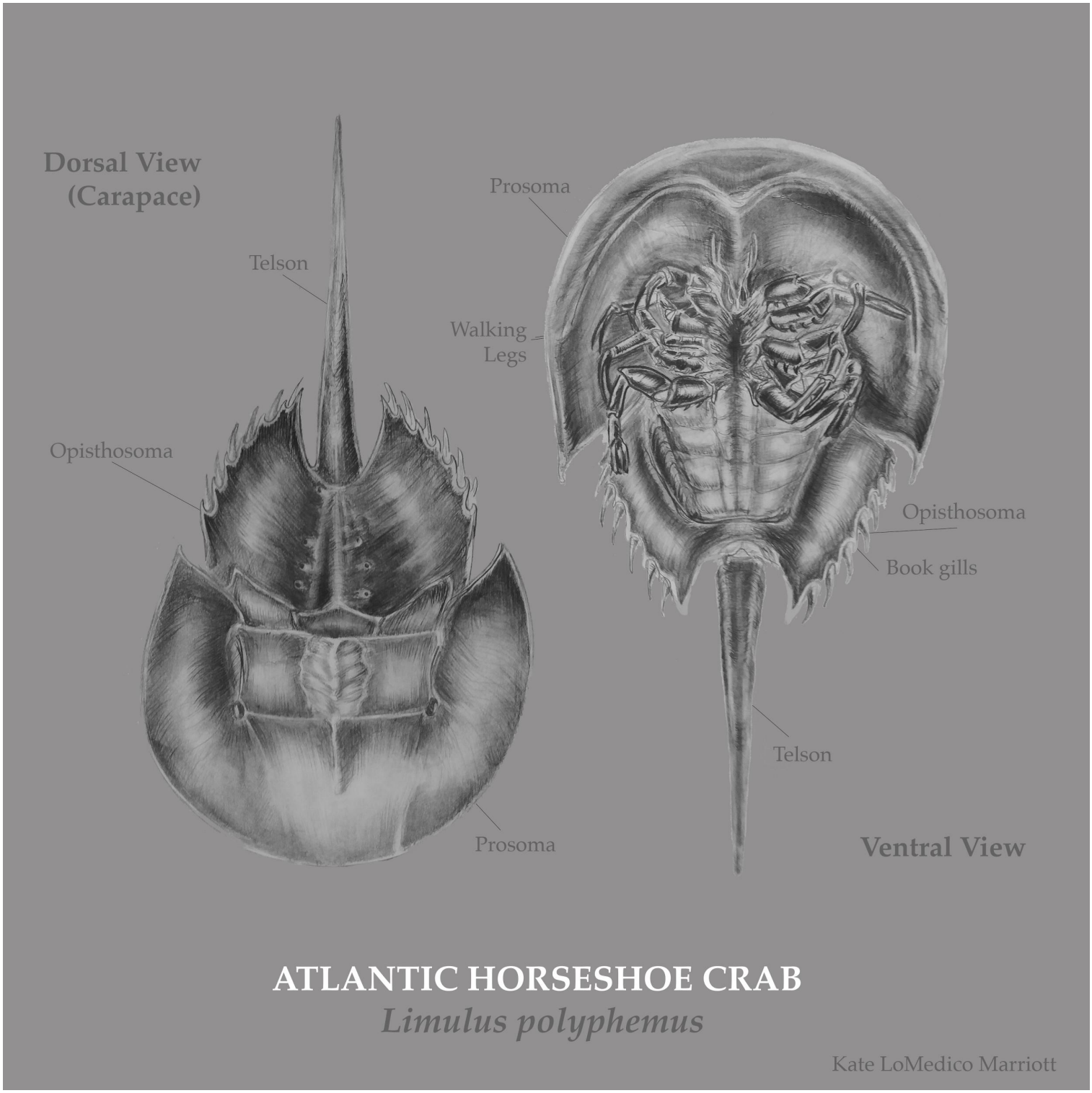


These enoromous beasts, part of the "sauropod" group of dinosaurs, were part of one of the first scandals to rock the field of natural history. The remains of *Camarasaurus* were combined with bones from the similar *Apatosaurus*, and the infamous *Brontosaurus* was born.

Sauropods were most common in the Jurassic Period, and were commonly adapted for munching the tops of tall trees and ferns. They were nearly all migratory, and used their size and numbers as defense from predation.



ATLANTIC HORSESHOE CRAB

Limulus polyphemus

Kate LoMedico Marriott