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**ART IN THE SWAMP: USING FIELD ILLUSTRATION TO PREPARE
DRAWINGS OF MANGROVE COMMUNITIES AT TWIN CAYS,
BELIZE, CENTRAL AMERICA**

BY

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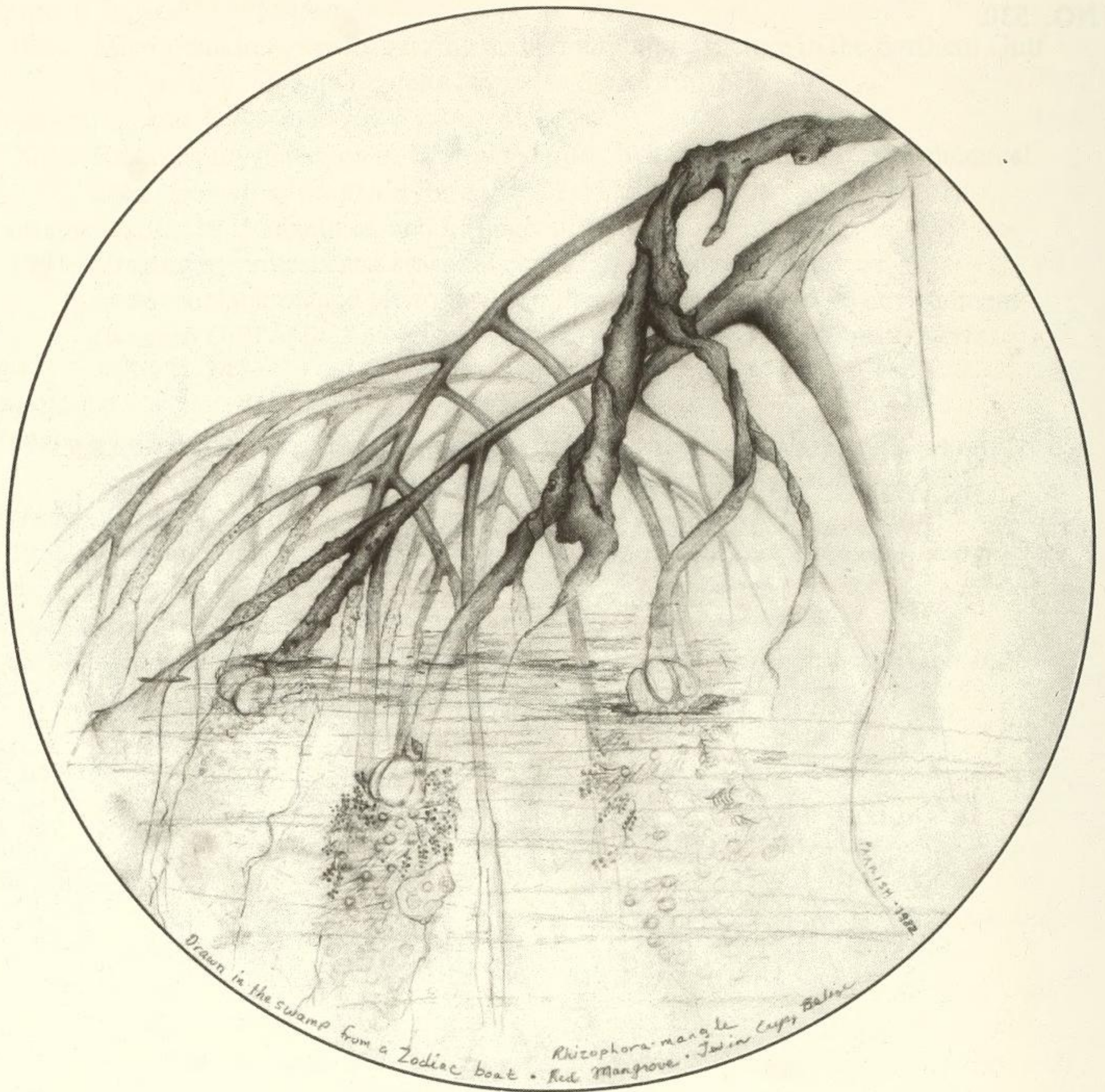


Figure 1. Field sketch of red mangrove stilt roots drawn while afloat in a boat.
Illustration by Mary Parrish, 1982.

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ABSTRACT

In 1981, the Smithsonian West Atlantic Mangrove Program (SWAMP) began sending scientific illustrators into the field with scientists to study the mangrove environment and prepare drawings of the ecological communities of Twin Cays. Rather than working only from preserved specimens and photographs in a museum setting, artists observed and sketched terrestrial, intertidal and subtidal habitats in situ and collected live specimens that were drawn and photographed at the field station on Carrie Bow Cay, Belize. The project was called *Art in the SWAMP*.

INTRODUCTION

Scientific illustrators generally prepare drawings in a studio setting using preserved specimens, verbal description and photographs as reference material. Traditionally, the organisms are carefully positioned on a white or black background with lighting from the upper left so that taxonomic characters are presented in a clear and predictable way to the scholarly reader.

Klaus Ruetzler, sponge biologist and director of the Caribbean Coral Reefs Ecosystems Program, instead asked artists to produce a series of illustrations based on field observation that were not prepared for taxonomic description, but were designed to show how plants and animals appeared in life and interacted in the terrestrial, intertidal and subtidal communities of the mangrove ecosystem. He invited several artists to work alongside scientists at the Carrie Bow Cay field station to observe and sketch the environment in situ. Among these, Smithsonian artists Candy Feller, Molly Ryan and Mary Parrish have participated in this project, with Candy Feller as lead artist for many years.

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PREVIOUS WORK

Historically, artists have often been an important part of scientific expeditions: Captain James Cook employed the artist William Hodges, and later John Webber, to document his voyages around the world that began in 1768 (Thomas, 2003); David Starr Jordan asked Bistrow Adams to accompany him to the Pribylof Islands to draw fur seals from nature in 1896 (Jordan, 1896); William Beebe invited artists Isabel Cooper, Helen Tee-Van and Don Dickerman to join his *Arcturus* expedition to illustrate his discoveries from New York to the Galapagos Islands in 1925 (Beebe, 1926); and the ornithological illustrator, Louis Agassiz Fuertes, participated in many field expeditions including those organized by the American Museum of Natural History and the Field Museum. Many other examples exist in the history of science.

Natural history artists such as John James Audubon and Roger Tory Peterson, and fine artists such as Leonardo da Vinci and Albrecht Dürer insisted on the importance of working from nature. In the late 1800s, sketching and painting directly from nature became central to the work of Realist painters such as John Constable, and later those of the Barbizon, Impressionist and Post-Impressionist schools that included fine artists such as Vincent van Gogh, Claude Monet, and Paul Gauguin. These artists rebelled against the classical academic tradition of painting in the studio and moved outdoors to paint "en plein air" (in the open air). A school of Plein Air painters is still active today.

Photography has replaced some of the work of the field artist, but illustration is still used to synthesize complex subject matter, such as ecological communities, or to clarify structure in specimens that the camera cannot record adequately. In addition, illustration portrays nature in a way that is aesthetically unique.

Excellent previously published pen-and-ink stipple drawings of communities that were helpful to this project include Sarah Landry's illustrations for *Sociobiology: The New Synthesis* by Edward O. Wilson (Wilson, 1975), and John Sibbick's illustrations for *Reef Evolution* by Rachael Wood (Wood, 1999). Sarah Landry worked for *Art in the SWAMP* during one field season as well.

METHODS AND RESULTS

Photographs were used when a literal depiction of a scene was needed, but for many projects, illustration worked better than photographs to present the information required by the scientists. Three-dimensional cutaways, composite drawings of idealized communities made from a series of observations that took place over a period of time, clarification of material through the elimination of distracting information such as mud, sand or debris, enhancement of details that would otherwise be too subtle to communicate, and use of block diagrams were some of the techniques illustrators used to help present data that a camera could not (Figs. 1 - 3). Illustration was also used to depict specimens whose shape, color patterns and structure were difficult to preserve, such as sponges, tunicates and other soft-bodied invertebrates, when depth of field extended beyond the camera's capability, or parallax would cause distortion in a photograph.

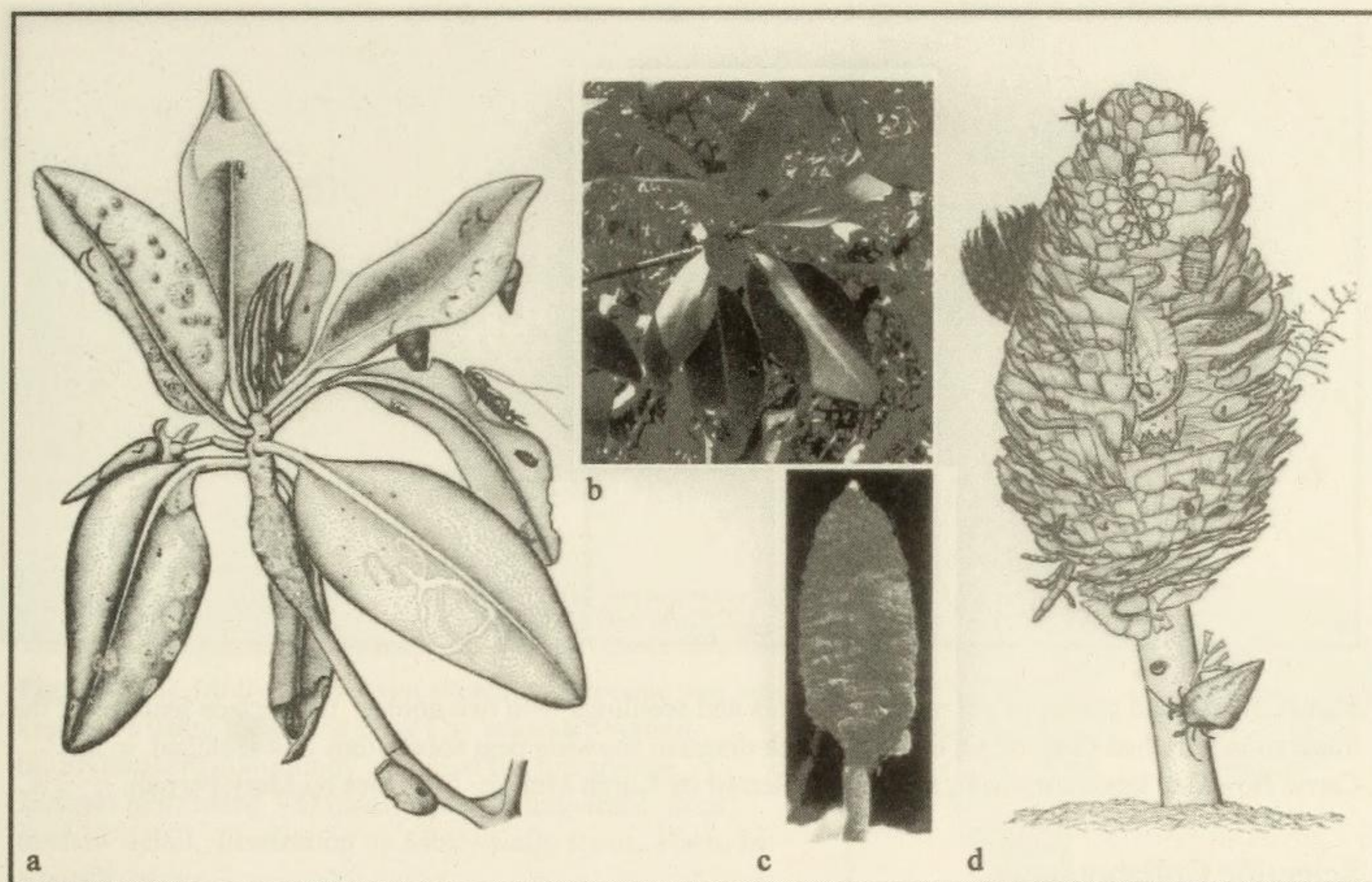


Figure 2. Stipple drawings of idealized communities shown with photographs of the same subject matter: a) Red mangrove, *Rhizophora mangle*, leaf cluster with insects and snails. b) Marine alga, *Rhipocephalus phoenix*, with microcommunity. Clarity of subject matter is the hallmark of a good pen-and-ink drawing. Illustrations by Candy Feller. Photo in 2a by Mary Parrish. Photo in 2b by Candy Feller.

The Field Sketch

Field observation and sketching are very important for all artists who want to portray nature in their work. Nature is infinitely complex, subtle, exciting and unpredictable. What artists imagine in their studios or copy from a photograph or other artists' work is useful but will never be as valuable as what is observed firsthand in the field. Perspective, light, shadow, color, composition, and other artistic considerations can be seen more clearly in the field, and biological information such as the interactions between plant, animal and environment, and mannerisms and habits of species are understood best by direct observation. Immersion in nature impacts illustrators and, in turn, the illustration - both scientifically and aesthetically. While discomforts in the field can hamper work in some respects, the benefits outweigh the difficulties.

A field sketch is direct, usually gestural (Fig. 3a), and can capture a scene with a freshness that is often lost when drawing from a photograph or preserved specimens. The field sketch can later be used as a compositional base for an illustration where details are more carefully worked out and the drawing is more refined (Fig. 3b).

Occasionally, field sketches were prepared for aesthetic rather than scientific reasons (Fig. 1). Drawings of this type can help individuals, who might otherwise be indifferent or hostile towards an ecosystem, gain an appreciation of the ecosystem while at the same time bring pleasure to those who are fond of it already.

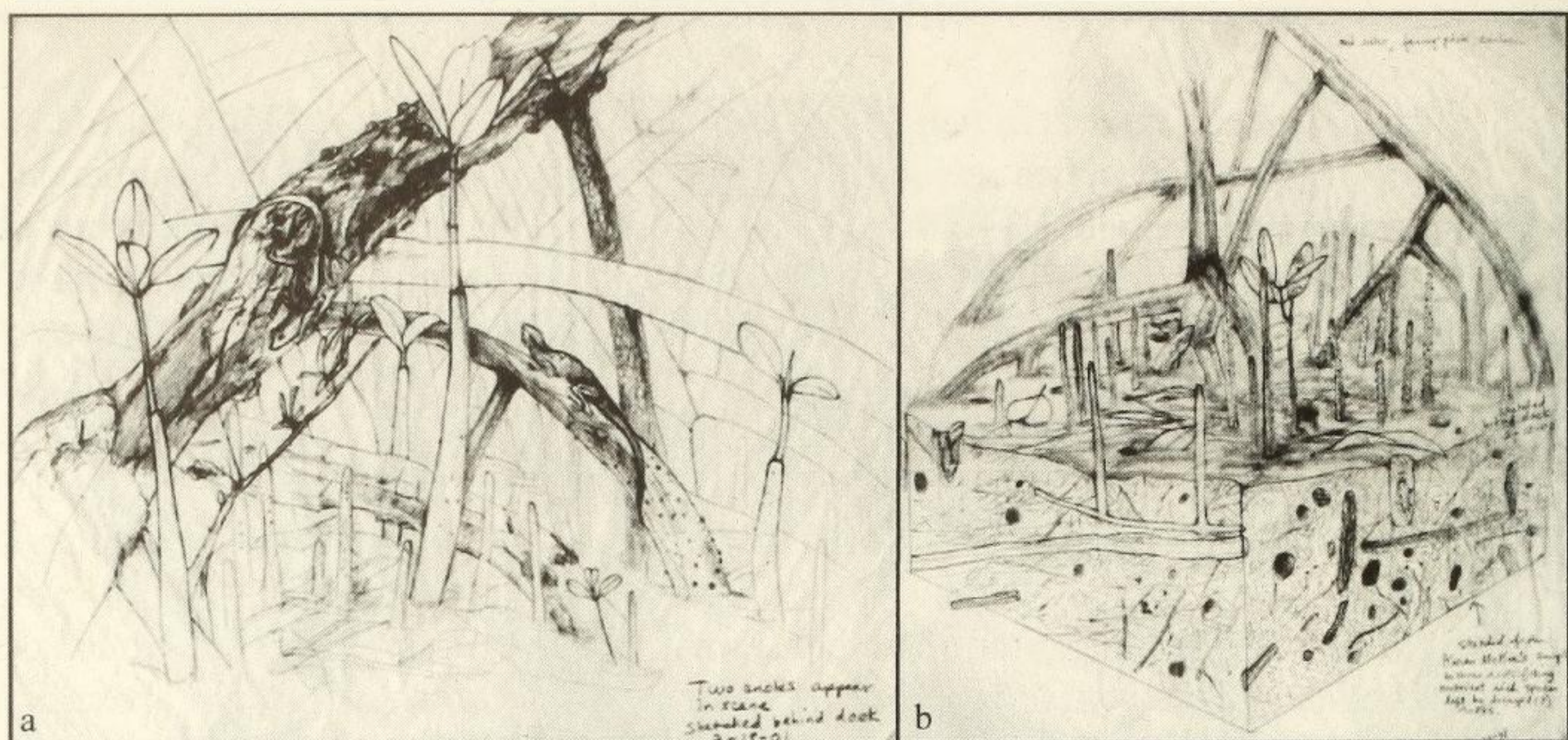


Figure 3. a) Field sketch of red mangrove roots and seedlings with two anoles. b) Surface features of the illustration sketched in the field; cutaway block diagram showing peat substratum was sketched in the Carrie Bow Cay laboratory from a sample collected by Karen McKee. Sketches by Mary Parrish.

Scientific Collaboration

While many illustrations were prepared independently by Candy Feller, such as those in Figure 2, artists Mary Parrish and Molly Ryan often worked alongside scientists acting as field assistant, dive buddy, and photographer, as well as artist. For example, Molly Ryan worked with Klaus Ruetzler to prepare a community illustration of the sponge *Tedania ignis* (Fig. 4). Drawings were often developed during the research process and recorded in a sketch as discoveries were made. Collaboration in the field, the laboratory, and during informal discussions throughout the day and evening were beneficial to the illustration process.

Often one or more host specimens were collected and returned to the Carrie Bow Cay laboratory in order to observe and extract live organisms hidden inside and to prepare a composite drawing. Examples of composite illustrations can be seen in the mangrove branch (Fig. 2a), marine alga (Fig. 2b), and sponge (Fig. 4b). Artists first drew the host organism. After noting posture and position, associated plants and animals were removed, sketched, and photographed. Finally, all the individual elements were combined into a single drawing. Specimens, such as sponges, were carefully cut in order to draw their internal structures. Artifacts left by any inhabitants, such as spaces and burrows, were also recorded. Artists prepared drawings with cutaway views and inset enlargements in order to show the subsurface details when necessary (Figs. 3b, 4a).

Each organism was identified by a scientist and the subsequent drawing was checked for accuracy. Specimens were preserved and labeled to use as voucher and reference material upon return to the museum. Photographs were also used for reference when completing the final illustration in the studio.

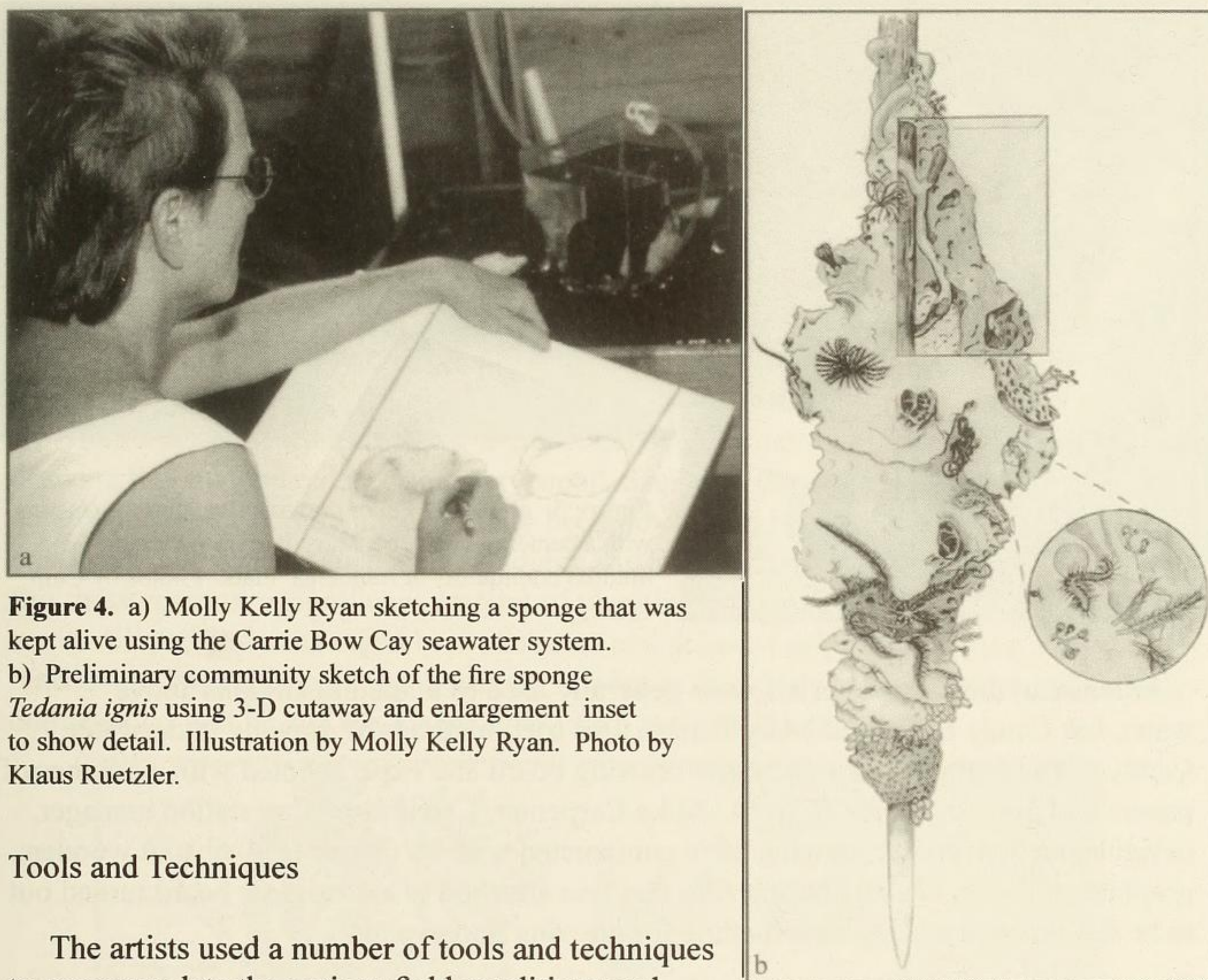


Figure 4. a) Molly Kelly Ryan sketching a sponge that was kept alive using the Carrie Bow Cay seawater system. b) Preliminary community sketch of the fire sponge *Tedania ignis* using 3-D cutaway and enlargement inset to show detail. Illustration by Molly Kelly Ryan. Photo by Klaus Ruetzler.

Tools and Techniques

The artists used a number of tools and techniques to accommodate the various field conditions and habitats found at Twin Cays. The supply list included tracing or other drawing paper, drafting film (which is stable even when wet), watercolor paper, large metal clips, rubber bands, tape, retractable pencils, leads, pencil sharpener, knife, kneaded eraser, tape, plastic bags, drawing board, sunglasses, bug repellent, collecting bags, field notebook, rain gear, and camera. Optional supplies were additional media such as watercolor or acrylic paint, charcoal, ink, or other materials.

Large clips, rubber bands and tape were used to hold paper steady in windy conditions. Watercolor paper often comes in a pad that is glued on all four sides and was useful on windy days. When a sketch on this paper was finished, the adhesive edges of the paper were slit with a knife and the drawing lifted off the pad. Retractable mechanical pencils were used in the field because the leads were protected while not in use. Sun is very reflective on white paper, so artists worked in the shade or wore sunglasses. Plastic bags were used to protect supplies from rain and seawater. Many of these supplies seem self-evident, but if they are forgotten in a remote area problems arise.

Illustration tools varied according to the habitats of specific subject matter and the size and scale of the community to be drawn. Microcommunities were collected and drawn live in the Carrie Bow Cay lab using microscope and camera lucida (Fig. 5a). Large scale communities, such as mudflats and overviews of the mangrove swamp (Fig. 5b), and occasionally even underwater scenes were drawn in situ (Fig. 6).

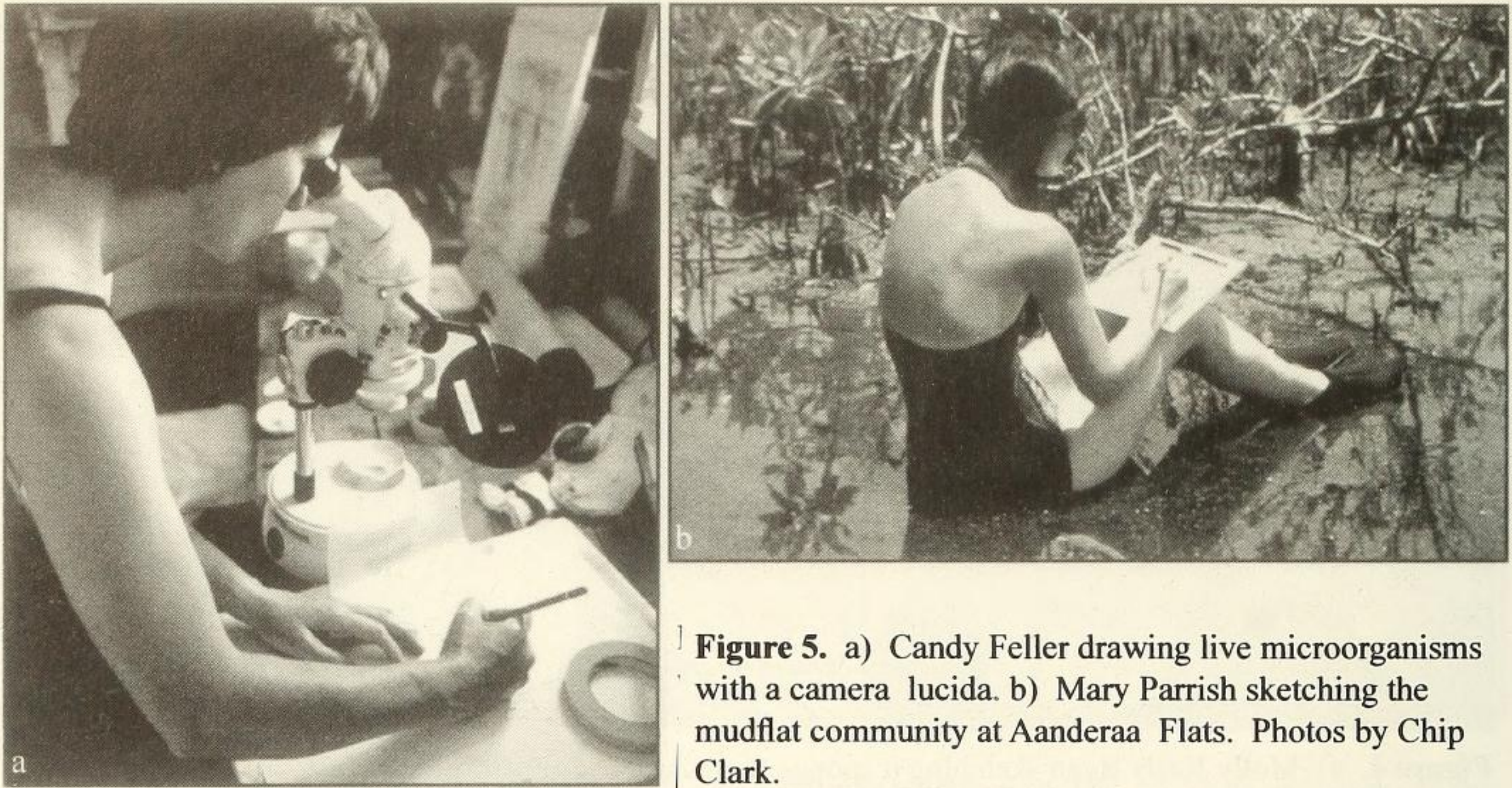


Figure 5. a) Candy Feller drawing live microorganisms with a camera lucida. b) Mary Parrish sketching the mudflat community at Aanderaa Flats. Photos by Chip Clark.

Traditional drawing materials were generally used to make illustrations above water, but Candy Feller and Mary Parrish also tried methods of drawing underwater. Candy Feller designed an underwater drawing board and experimented with a number of papers and drawing media (Fig. 6). Mike Carpenter, Carrie Bow Cay station manager, designed an underwater drawing table constructed with PVC pipe (Fig. 6b). A wooden graphite pencil on Denril drafting film that was attached to a plexiglass board turned out to be the simplest and the best method for drawing underwater.

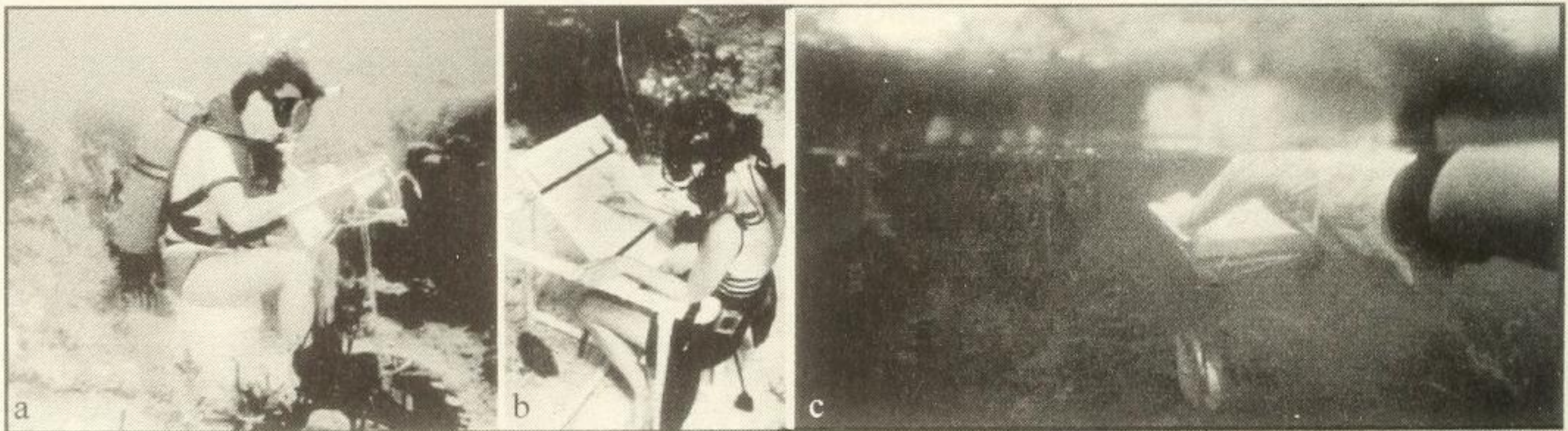


Figure 6. a) Candy Feller using her prototype drawing board. b) Mary Parrish using an underwater drawing table constructed by Mike Carpenter. c) Mary Parrish drawing subtidal mangrove roots at Twin Cays using Candy Feller's underwater drawing board. d) Underwater sketch of the reef NE Carrie Bow Cay and Twin Cays. Photo 6a by Klaus Ruetzler. Photo 6b by Mike Carpenter. Photo 6c by Chip Clark. Field sketch 6d by Mary Parrish.



Composition

Preparing a community illustration that is scientifically correct and still appears natural is difficult and composition is one of the most challenging parts of developing the illustration (Fig. 7). Nature usually does not present itself in the manner required by the scientist for the illustration or a photograph would have been used in the first place. Idealized communities, sometimes called “family portraits”, contain many more animals and activities than are seen normally at any given moment and views that show underground, underwater and above ground views simultaneously are two examples this problem.

Often a scientist wants to show a great deal of information in the space of a single drawing that may be reduced to a very small size, such as a 3.25 inch column width, when published. A drawing can easily become cluttered if the composition is poor and confusing, and aspects such as light source, scale and perspective are not well designed. For these reasons, a significant amount of planning takes place and preliminary sketches are developed and exchanged between artist and scientist prior to preparing a final rendering. The more organisms that are needed in the illustration, the more difficult the composition will be and the longer it will take to finish the drawing.



Figure 7. Stipple drawing of idealized mangrove mudflat community showing proper composition and stipple technique. Illustration Molly Kelly Ryan.

The focal area of an image should generally be offset from the center and located towards one of the corners. The artist should lead the eye around the drawing using lights, darks, line, and form to move the eye in a comfortable way that is not too jarring. Foreground, middle ground and background should be established through the use of tone and scale. Line weight that is heaviest is used for foreground information. This will give the effect of aerial perspective because the stronger elements will appear to move forward in space. Contrast in lights, darks, and texture will add visual interest to a composition. Block diagrams (such as the one seen in Fig. 3b) can also help organize the composition of a complex illustration. Proper aerial and linear perspective, scale, correct shading and water reflections, along with interesting subject matter and careful rendering of the drawing, will all help create a successful illustration.

Final Rendering

Guidelines were established to assure aesthetic cohesiveness among illustrations prepared by several artists. Line weight, size of illustration, percent reduction of drawing for publication, technique, drawing substrate, method of showing enlargements, plate arrangement, use of borders and use of scales were all standardized. Drawings were planned for 1/3 reduction (to 67%). Artists rendered the illustrations in pen-and-ink stipple technique using 4x0 technical pens on Denril drafting film to prepare the final art. Care was taken to make sure stipples were round, not ragged. Stipples were spaced far enough apart so as not to touch one another and so that they did not block up when reduced. Fresh ink was used to ensure that the ink was very black. As ink ages it becomes gray because the carbon separates from the alcohol and cannot be remixed. A good reference for preparing scientific illustrations is *The Guild Handbook of Natural Science Illustration*, edited by Elaine R.S. Hodges (2003).

CONCLUSIONS

Science provides the data needed to understand and conserve the mangrove ecosystem and to relate it to the needs of the larger world. Scientific illustration synthesizes this information visually for dissemination to scholarly and lay communities. A substantial portfolio of sketches, finished stipple drawings, and photographs has been prepared for use in scientific and popular publications, exhibits, and websites.

The mangrove is scientifically and aesthetically exciting. Having experienced Twin Cays my (MP) main response to the mangrove is not scientific curiosity alone. I probably speak for my other colleagues too when I say that I am awed by the beauty of the mangrove. While I sit quietly to draw, the usual mangrove characters appear: brown anoles; mangrove crabs and warblers; termite nest; seed pods just beginning to grow in the mangrove branches; subtidal roots covered with sponges, tunicates and ophiuroids; fish swimming among the roots. These and many other communities are available for study but it is the aesthetic inspiration of the mangrove that I value most (Fig. 8).



Figure 8. A mangrove warbler catches a moth at Twin Cays. Field Sketch by Mary Parrish.

ACKNOWLEDGMENTS

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