Atlas of Aquatic Dermatology

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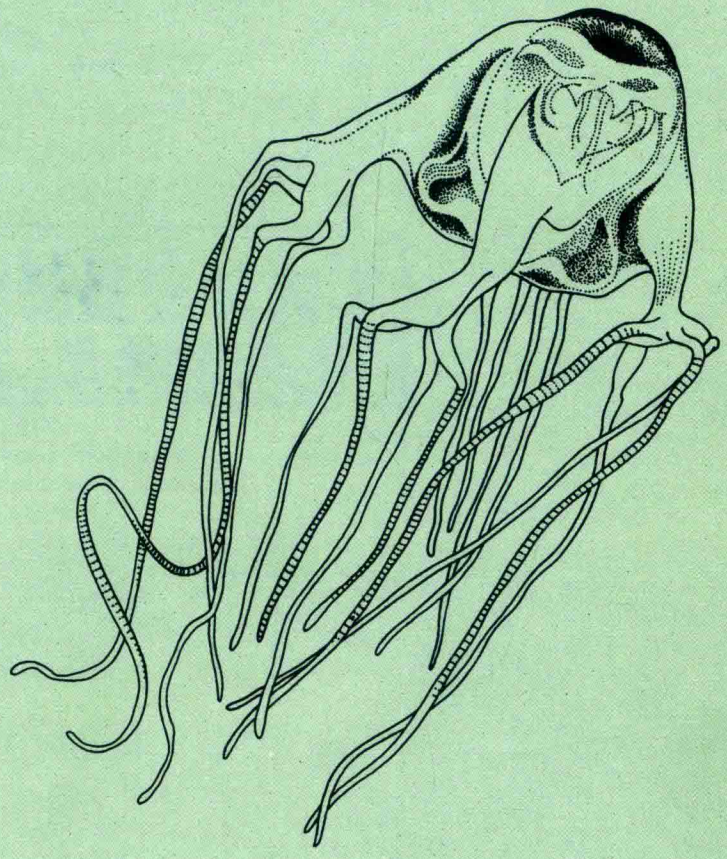

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A.A.F.

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Introduction

It is paradoxical that, in our age of modern technological advance and myriad amusements, man's primitive urge for sea and surf actually seems to be accelerating.

According to estimates, approximately 80 per cent of the world's population will have migrated to coastal areas by the year 2000. Many Americans are drawn to the water—both coastal and inland—for recreational purposes.

A 1975 report from the National Oceanic and Atmospheric Administration indicates that there are some three million recreational divers and one million commercial, military and scientific divers in the United States today. Add to this the untold numbers of swimmers, surfers, snorklers, water skiers, and fishing and boating enthusiasts, and one can begin to appreciate the lure that our fresh and salt waters hold for millions of Americans.

Little wonder, then, that water-related injuries and diseases have shown a precipitate increase from year to year and that aquatic medicine has developed as a specialty in its own right. Much recent attention has been given to "scuba sickness" (air embolism, decompression sickness) and its attendant hyperbaric therapies. On the other hand, the important field of aquatic dermatology has been comparatively neglected—despite the empiric observations of both coastal and inland dermatologists throughout the country that they are seeing more and more patients with water-related dermatoses.

Our oceans, lakes, swamps, swimming pools—and even fish tanks—contain numerous creatures and plants, large and small, as well as a multitude of microscopic organisms. Many of these water organisms have evolved self-protective stinging, biting and envenomating mechanisms capable of producing unique and various skin eruptions, along with occasional systemic reactions.

In addition to the considerable variety of water-related skin manifestations, management of aquatic dermatoses is further complicated by the much-discussed mobility of modern man. Patients jet to distant locales on vacation or business, immerse themselves in strange oceans, lakes and rivers—and frequently return with "imported" water-related skin lesions. Since some of the skin mani-

festations do not appear for weeks or even months, the dermatologist in Connecticut or Kansas may well be required to manage an unfamiliar condition originating in Bermuda or Aruba. By the same token, the patient presenting to a California or Idaho dermatologist with an apparent water-related dermatosis may have recently returned from the Great Lakes region—a frequent source of cercarial dermatitis produced by freshwater schistosomes.

Although many of these conditions are self-limiting, they nevertheless require attention. Appropriate first aid treatment is certainly indicated for such symptoms as pruritus, painful lesions, bullae or wounds. More important, related systemic pathology can lead to disastrous consequences if left untreated. A high index of suspicion is essential. In many instances, prompt and accurate diagnosis is vital and even life-saving.

Until publication of this volume, dermatologists have had to cope with water-related dermatoses without benefit of a basic reference work. Outside of a brief chapter in my book on *Contact Dermatitis* (Lea and Febiger, 1973), extensively organized material on the subject is virtually nonexistent in the medical literature. Exposure to this growing field of aquatic dermatology is also quite sparse in medical school or during residency.

Clearly the time is ripe for a single, central reference work dealing with water-related dermatoses, and this *Atlas of Aquatic Dermatology* has been prepared to fulfill this need.

Here the practicing dermatologist will find discussions of such diverse dermatoses as *swimmers' itch, sea bathers' eruption, creeping eruption, trench foot, aquagenic urticaria* and *swimming and fish tank granulomas*. The effects of venoms, stings, bites and spines of various aquatic organisms are thoroughly elucidated.

This *Atlas* is meant to serve a three-fold purpose: 1) to acquaint the physician with the etiologic factors of aquatic dermatitis; 2) to portray in word and photograph the clinical appearance of various aquatic dermatoses as an aid to differential diagnosis; and 3) to provide the physician with pertinent therapeutic information, enabling him to institute the most current means of managing the manifold forms of aquatic dermatitis.

Photographs of both water organisms and clinical symptoms are provided. In addition, the usefulness of this *Atlas of Aquatic*

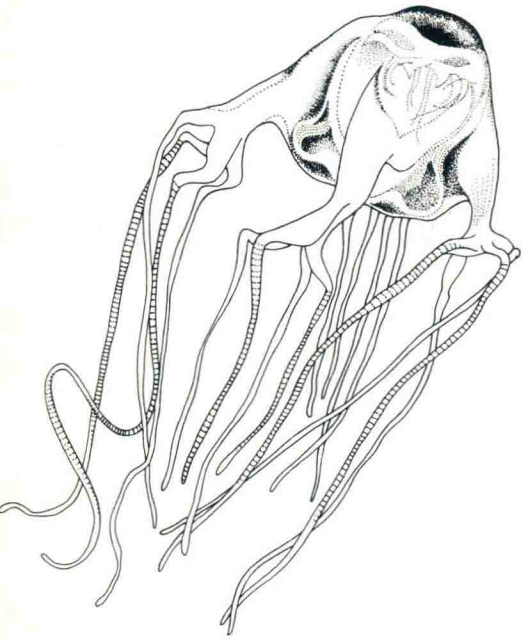
Dermatology has been enhanced by the inclusion of a geographic cross-index of dermatosis-producing aquatic organisms. By utilizing the text and photographs as well as the geographic index, the clinician can not only feel confident in managing the protean forms of aquatic dermatitis and injury, but also have a specific basis on which to advise patients who plan to enter unfamiliar waters.

I

Dermatitis Caused by the Portuguese Man-of-War, Jellyfish, and Related Coelenterates

Portuguese man-of-war *Physalia physalis*

Dermatitis Caused by the Portuguese Man-of-War, Jellyfish, and Related Coelenterates



To prevent dormant nematocysts (stinging capsules, nettle cells) remaining on the skin from "firing," patients should:

1. Avoid contact with freshwater.

2. Avoid rubbing affected area.

An individual emerging from the sea with complaints of itching or burning is generally unaware that he may have struck a marine creature equipped with nematocysts, or "stinging capsules." However, careful history-taking should immediately alert the clinician to such a possibility. History-taking is particularly essential because nematocysts can often remain harmlessly deposited on the skin for a time, only to "fire" later when activated by a specific stimulation.

Nematocysts are found only within the phylum Coelenterata. Coelenterates are radially symmetrical animals of simple structure. The mouth opens into a single cavity, and the body wall is formed by two layers of cells with structureless jelly between them. Almost all coelenterates possess nematocysts. These "stinging capsules" are especially concentrated on the tentacles.

This large and variegated phylum is particularly abundant in all tropical and subtropical waters. Of the 9,000 or so species that have been identified, approximately 100—including jellyfishes, sea anemones, fire corals, and the Portuguese man-of-war—are capable of producing injuries to man. The classes within this phylum and several clinically significant species are shown in Table 1-1.

Most dreaded of the coelenterates is the Portuguese man-of-war, a creature whose ominous character has assumed almost legendary proportions. While the effects of contact with the Portuguese man-of-war (discussed later) may be severe, its sting is rarely fatal. In fact, the most dangerous of the coelenterates appear to be several of the Australian Cubomedusae: the carybdeid "irukandju," and the chiropropids *Chironex fleckeri* and *Chiropsalmus quadrigatus*.[1]

The Nature of Nematocysts

These dead organoids—also known as "nettle cells" in addition to "stinging capsules"—contain the toxic substance of the coelenterate.

Each nematocyst contains a spirally-coiled thread with a barbed end. Upon contact, this thread is uncoiled and forcibly ejected—along with a toxin—into the skin. The size of the barb and the toxic substance it introduces vary widely in different species.

The stimulation necessary to discharge a nematocyst apparently involves both chemical and mechanical factors. It has been shown that freshwater stimulates the "firing" of nematocysts. Friction may also cause nematocysts to "fire," and patients suspected of

Fig. 1-1.

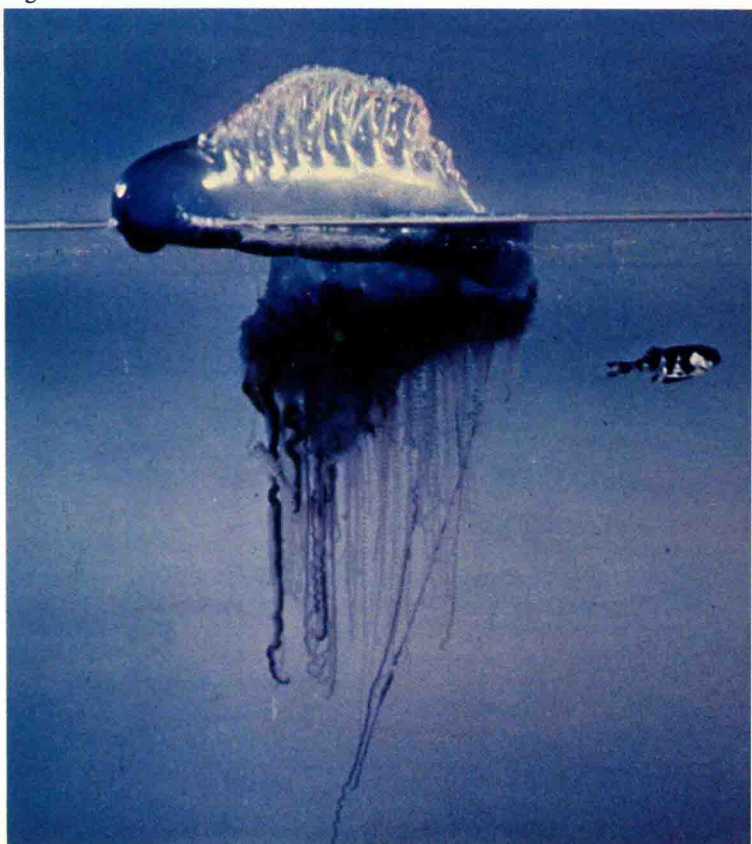
Fig. 1-2.

Fig. 1-1. *CHIRONEX FLECKERI,* found primarily off the northern coast of Australia, is also seen in the Caribbean, the Gulf of Mexico and off the Atlantic coasts of North and South America. Fatalities are said to ensue in 15 to 20% of stingings. Courtesy of Bruce W. Halstead, M.D.

Fig. 1-2. *SEA ANEMONE.* All species in this group of phylum Coelenterata, class Anthozoa, have nematocysts. Because of their variety of colors, animal sea anemones frequently have a flower-like appearance similar to plant anemones. They are not as harmless, however, as their botanical name-sakes because they can cause dermatitis. Other sea anemones produce dermatitis by a sting rather than by nematocysts.
Courtesy of Michael D. Rosco, M.D.

Fig. 1-3. *PHYSALIA PHYSALIS* drags numerous fishing tentacles containing bead-like batteries of nematocysts along their entire length. Since the tentacles of this hydroid sometimes reach a length of 100 feet, swimmers can be severely stung even at a distance from the animal. The stinging capsules penetrate the skin and inject a fluid containing a neurotoxin.
Courtesy of Bruce W. Halstead, M.D.

Fig. 1-3.



being contaminated with nematocysts should be advised to avoid rubbing or scratching affected areas.

Nematocysts can produce a severe burning, pruritic, erythematous eruption which may be accompanied by urticaria and anaphylactic shock.

Nematocyst Venom

High molecular weight toxins isolated from coelenterates have been shown to be heat labile, nondialyzable, and degraded by proteolytic agents. In many animal species, these toxins appear to inhibit nerve activity by altering ionic permeability. The toxins may also induce cardiac dysfunction.

Experimental studies have shown that animals contacting or receiving the venom parenterally experience severe pain and paralysis in the central nervous system soon after envenomization. Other sequelae may include urticaria, pruritus, edema, paralysis, cardiac arrest, and death.

A toxic protein-tetramine complex seems to be operative in coelenterate extracts. Paralysis and central nervous system effects appear to be primarily related to toxic proteins and peptides and secondarily to the presence of tetramine. Burning pain and urticaria can probably be explained by the presence of serotonin, histamine, or histamine-releasing agents in the venom.

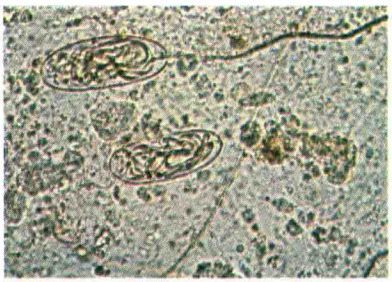


Fig. 1-4. *NEMATOCYSTS* of the phylum Coelenterata are dead organoids. Also known as "nettle cells" or "stinging capsules," they contain the toxic substance.
Courtesy of Bruce W. Halstead, M.D.

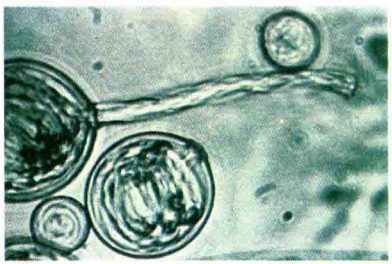


Fig. 1-5. *PHYSALIA NEMATOCYSTS.* Each nematocyst contains a spirally-coiled thread with a barbed end. Upon contact this thread is uncoiled (as seen here) and forcibly ejected along with a toxin into the skin.
Courtesy of H. L. Arnold, Jr., M.D.

Range of Dermatologic Reactions*

Dermatitis resulting from contact with nematocyst-containing tentacles varies with the concentration of stings and the toxicity of the venom. The severity ranges from a mild stinging to a marked burning sensation. There is usually a linear, papular eruption accompanied by erythema and edema. Severe dermatitis may be accompanied by pain and marked itching.[2]

Urticarial eruptions possibly accompanied by anaphylactic reactions—pronounced weakness, edema of the throat and larynx—occur with some frequency. Shock and death may ensue in children and in those with exceptional hypersensitivity.

Principles of Treatment†

In the past, various recommendations for the alleviation of coelenterate stings included the application of vinegar, alcohol, ammonia, urine, ice water, hot water, potassium permanganate crystals, formalin, barnacle juice and meat tenderizer.