FM 31-2

WAR DEPARTMENT

BASIC FIELD MANUAL

# JUNGLE WARFARE

December 15, 1941



FM 31–20

# BASIC FIELD MANUAL

# JUNGLE WARFARE

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Prepared under direction of the
Chief of Staff

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WAR DEPARTMENT,
WASHINGTON, December 15, 1941.

FM 31–20, Jungle Warfare, is published for the information and guidance of all concerned. Its provisions should be studied in conjunction with FM 100–5, FSR, Operations.

[A. G. 062.11 (12–3–40).]

BY ORDER OF THE SECRETARY OF WAR:

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DISTRIBUTION:

B and H (6); R and L (3).

(For explanation of symbols see FM 21–6.)

FM 31-20

# BASIC FIELD MANUAL

## JUNGLE WARFARE

CHANGES No. 2

WAR DEPARTMENT,
WASHINGTON, August 3, 1942.

FM 31-20, December 15, 1942, is changed as follows:

■ 20. FOOD.

* * * * * * *

*c.* Clean food is essential. A lifelong disease such as amoebic dysentery may be contracted from eating even the smallest amount of unclean or contaminated food. The following rules are given for keeping food clean:

(1) Keep flies and all other insects away from food and utensils.

(2) Stay away from native houses, which are frequently the worst sources of disease.

(3) Wash hands before eating. The use of soap is essential if cleanliness is to be assured.

(4) If forced to eat foods cooked by natives, be sure to dish it up while it is boiling. Put it into a plate which has been washed and disinfected.

(5) Disinfect each drinking or eating vessel. A little strong chlorine or iodine solution will kill germs.

(6) Clean the top of every can and the can opener (or blade of knife used for can opener) by pouring a small amount of boiling water over them, or by using a small amount of disinfected water from the canteen. If the contents of the can are more than will be used at one meal, pour the desired amount from the can into the mess kit. The remainder of the can is sterile and will keep until the next meal if it is protected from insects and not disturbed or contaminated by introducing into it a utensil or other device. There is no danger of keeping food in the original container if it is handled in this manner.

(7) Cook all meats until they are thoroughly done.

(8) Cook only enough food for one meal. Do not keep cooked food for future meals.

[A. G. 062.11 (6-17-42).] (C 2, Aug. 3, 1942.)

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■ 21½. Alcohol.—Do not drink liquor in the jungle. In excess, it numbs the senses; it leads to excesses and the violation of fundamental health rules. It may be the direct cause of sickness which not only affects the man personally but decreases the effective fighting strength of the whole military team.

[A. G. 062.11 (6–17–42).] (C 2, Aug. 3, 1942.)

■ 24. EXPEDIENTS.

* * * * * * *

*n*. Do not fear the jungle. A man can travel alone for weeks in uninhabited country if he keeps relaxed and uses his head. Do not try to tear a path through vines or other jungle growth. Cutting a path saves energy. Pick a route carefully, making full use of the sun, the stars, the compass, and the terrain. Do not try to bully or rush the natives. Always pay them a fair price for everything purchased from them. A jungle soldier should not use terrorist methods against the natives to get them to work for him or conceal word of his whereabouts from the enemy. Jungle natives move about a great deal; seldom are all members of a family at home at the same time; but if they are not threatened or abused they will seldom rush news of a soldier's presence to the enemy. Therefore, the jungle soldier who abuses or antagonizes the natives is working against himself. If a native is wronged that native becomes the soldier's enemy and America's.

[A. G. 062.11 (6–17–42).] (C 2, Aug. 3, 1942.)

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# BASIC FIELD MANUAL

## JUNGLE WARFARE



CHANGES } WAR DEPARTMENT,
No. 3 } WASHINGTON, September 24, 1942.

FM 31–20, December 15, 1941, is changed as follows:

■ 13. FUNGUS DISEASES OF THE SKIN AND HAIR.

* * * * * * *

*c. Remedial action.*—Fungus diseases, if neglected, will certainly incapacitate many individuals regardless of personal cleanliness and the use of foot powder. At the first symptoms of a fungus infection, prompt use will be made of the prescribed medicine carried in the individual or group first-aid kits (see app. VII). In the event of excessive inflammation or itching, a medical officer will be consulted as soon as possible.

[A. G. 062.11 (9–3–42).] (C 3, Sept. 24, 1942.)

■ 16. USE OF SALT.—Sweat results in the loss * * * during the period of heavy muscular exercise. Usually 10 to 15 grains of salt per day will be sufficient to maintain the salt balance of the body during this period.

[A. G. 062.11 (9–3–42).] (C 3, Sept. 24, 1942.)

■ 17. CLOTHING FOR JUNGLE SERVICE.—Clothing selected for jungle service * * * protect face and neck from the sun's rays. This clothing should be highly resistant to saw grass, thorns, brambles, and insect pests.

[A. G. 062.11 (9–3–42).] (C 3, Sept. 24, 1942.)

■ 18. CLOTHING AND EQUIPMENT.

* * * * * * *

*b.* Tight-fitting clothing is unsatisfactory since such clothing is hot and restricts movement. Articles of clothing and equipment made of wool, leather, or felt have proved unsatisfactory for jungle use due to their heat retaining qualities, absorption of moisture, and their susceptibility to mold and fungus rot. Such articles should be replaced whenever possible by cotton, rubber, and canvas items of clothing and equipment. As an article of outer clothing, the jungle suit, one piece, dark green, 6 to 8 ounce cotton, with zipper front extending from waistline in front, under crotch and to waistline in back, has been found highly satisfactory. Rub-

ber soled, low canvas boots are much superior to any leather foot wear. The helmet liner M1 has been found much more satisfactory than the fiber tropical helmet or the fatigue hat for jungle wear. This liner may be easily camouflaged by the use of leaves and twigs held in place by a rubber band. A head net and gloves which are mosquitoproof are an inseparable part of each individual's equipment. The raincoat should be replaced by a light-weight poncho.

[A. G. 062.11 (9–3–42).] (C 3, Sept. 24, 1942.)

■ 19. SLEEPING (superseded).—*a.* During the dry season, men can sleep comfortably on the ground. They must, however, sleep under mosquito nets.

*b.* (1) To sleep in the jungle during the rainy season, a man must be off the ground and under a mosquito net. This is best accomplished by the use of a hammock which meets the following requirements:

(*a*) Should not exceed 6 pounds in weight complete with netting.

(*b*) Fabricated of light, durable, waterproof material.

(*c*) Must be insectproof.

(*d*) Furnished with a rainproof adjustable top with attachable insect netting.

(2) Lacking a hammock similar to the one described in *a* above, improvised hammocks made of blankets, oblong pieces of canvas, or shelter halves may be used. Using only the present issue equipment, the two-man off-the-ground jungle bunk has proved serviceable although somewhat laborious to construct. This bunk has a platform 1 foot above the ground with its corners supported by four forked posts. A frame of 2-inch poles is laid in the forks and across this frame are laid thinner poles. All are fastened together with vines or strips of bark. The platform is then covered with light branches and leaves (free from insects) to form a mattress. A blanket is then spread over this mattress to hold everything in place and over all are pitched the shelter tent and mosquito net, or in dry weather, only the mosquito net.

[A. G. 062.11 (9–3–42).] (C 3, Sept. 24, 1942.)

■ 23. TRAILS.

* * * * * * *

*d.* When not in close proximity to the enemy and when rapidity of movement is essential, full use should be made of

existing trails and stream beds. However, in enemy infested country, existing trails are a source of ambush. When in close proximity to the enemy, men in squads and platoons should habitually cut their way forward off trails on a compass course. This method of travel is slow and laborious but affords the greatest measure of security. The dense jungle is not "impenetrable" to the experienced jungle soldier (see par. 44).

[A. G. 062.11 (9–3–42).] (C 3, Sept. 24, 1942.)

■ 68. OFFENSIVE ACTION (as changed by C 1).

* * * * * * *

*c.* Enveloping action by small units is more time consuming * * * than an envelopment executed in more open terrain. Operations in dense jungle country present an almost impossible task in determining the location of the enemy's flanks and their subsequent envelopment. Lacking open areas of ground or water, such flanking movements are slow and exhausting and their results are seldom commensurate with the time and effort expended. Under such conditions, infiltration through the enemy's lines, using jungle cover and concealment, offers the greatest possibilities for a successful attack. Enemy groups are thus cut off and destroyed in the shortest possible time.

*d.* Rescinded.

[A. G. 062.11 (9–3–42).] (C 3, Sept. 24, 1942.)

APPENDIX VII

■ 2. (Superseded.) INDIVIDUAL MEDICAL SUPPLIES.—The following are the component items of the individual medical jungle kit:

Bag, food, jungle—balloon fabric, lined with rubber.
Solution for athletes foot—Frazer's solution, one-half strength, 1-ounce bottle with screw top and triple slotted cork stopper.
Tablets, water purification—one bottle containing 200 tablets.
Tincture of iodine—2 percent; two 2-cc vials with capillary feed tip and screw cap.
Sulfadiazine—one packet of eight 0.5-gram tablets.
Quinine sulphate—2 plastic vials containing 5-grain tablets each.

Packet, first-aid—one.
Adhesive tape—one 5-yard roll, 1 inch wide, dry back type.
Insect repellent—two 1-ounce bottles with screw top and triple slotted cork stopper.
Tablets, sodium chloride—one 2-ounce bottle of 8-grain tablets.
Aspirin—two plastic vials containing twelve 5-grain tablets each.
Bandage, gauze, adhesive—one package.
Foot powder—one 2-ounce can with sifter top.
One 8-ounce waterproof duck roll with compartments for the above listed items.

NOTE.—All tablets in the above list will be packaged in watertight containers, either glass or plastic. Brief instructions for use will be printed on each container.

[A. G. 062.11 (9–3–42).] (C 3, Sept. 24, 1942.)

## APPENDIX IX (ADDED)

## JUNGLE CLOTHING AND EQUIPMENT

Band, camouflage, elastic, for helmet liner M1.
Boots, jungle (rubber sole, high uppers).
Socks, cushion sole.
Uniform, jungle (zipper, insectproof).
Flotation bladder.
Machete, 18-inch, individual.
Sheath for machete, 18-inch, individual.
Pack, jungle (waterproof rucksack).
Bag, clothing, waterproof.
Hammock, jungle.
Flashlight, lightweight, jungle.
Matchbox, waterproof, with compass.

[A. G. 062.11 (9–3–42).] (C 3, Sept. 24, 1942.)

BY ORDER OF THE SECRETARY OF WAR:

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# BASIC FIELD MANUAL

## JUNGLE WARFARE

CHANGES No. 4

WAR DEPARTMENT,
WASHINGTON, December 28, 1942.

FM 31–20, December 15, 1941, is changed as follows:

■ 13. (Superseded.) FUNGUS DISEASES OF THE SKIN AND HAIR.—*a. Diseases.*—Dhobie itch (epidermophytosis of the groin and body); athlete's foot (epidermophytosis of the feet); pinta, a fungus disease of the skin, characterized by pigmented patches; and trichosporosis, a fungus disease of the hair, are the principal fungus diseases. The seriousness of these diseases, especially those of the feet, is seldom realized except by men with long jungle experience. These diseases are especially serious in the jungle due to the fact that—

(1) The climate favors the growth of the tough plants called fungi which produce these diseases.

(2) The native inhabitants, their houses and premises are usually contaminated by harmful fungi.

(3) More individual effort is required to keep the body and clothes clean due to difficulty in supplying jungle troops.

(4) The extreme fatigue resulting from jungle marching is apt to cause soldiers to neglect to wash their clothes and bodies even though they have been told their health depends on cleanliness.

(5) Some men lacking jungle experience falsely believe they are tough enough to stay healthy in the tropics and need not take the precautions prescribed.

*b. Preventive measures.*—To prevent fungus diseases of the skin and hair is much easier than to cure them. The following preventive measures are important:

(1) Keep as *clean* as possible, and *wash* as often as practical. Use plenty of *soap* and *water*, when available, both for bathing and washing your clothes. Socks should be washed with soap at least once a day. If you cannot get to a stream when you make camp, use a part of your canteen water and a little soap to wash your armpits, groin and feet, at least. *Do not use a towel in the jungle.*



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(2) Don't go barefooted in the jungle.

(3) Avoid soiling your clothes as much as possible. Avoid mud. Use your machete to provide a clean place to rest during halts. To be dirty unnecessarily is a sign of stupidity, not toughness.

(4) Keep your skin *dry, well ventilated,* and free from tight clothing. Wear only enough clothing to protect you from insects and thorns. *Avoid wearing underclothes* unless forced to do so by the rubbing of your outer clothing. Wear clothing and shoes which allow air to reach your skin.

(5) *Sleep with as little clothing* as the temperature permits. *Never sleep in wet dirty clothing.*

(6) *Sleep off the ground,* preferably in a hammock or on a platform.

(7) Clean under and around the nails of your hands and feet.

(8) Take sunbaths for short periods whenever practicable. Be sure that exposure is increased gradually and the skin is not burned.

(9) *Stay away* from native houses. Live and camp in clean uninhabited jungle.

*c. Individual jungle treatment of fungus skin infections.*— (1) *During prolonged jungle operations each individual soldier must take care of his own skin* and make all possible effort to keep infected skin areas as *clean, dry, well-ventilated* and *protected* as possible. Soap and water help cure as well as prevent fungus infections.

(2) After washing and just before retiring, treat your infected skin areas with antifungus medicine or half strength iodine. Don't scratch insect bites; treat as above. *Iodine should not be applied before exercising or exposure to sunlight.* Although painful, washing your infected skin areas with undiluted alcohol is indicated in rashes around the crotch and under the arms. The Army foot powder helps both foot and body skin rashes of the milder types.

(3) In general, avoid bandages and greasy medicines. Dry up your fungus infections with drying medicines combined with air and sunlight.

(4) Clean off dead, infected skin. *Do not scratch.*

(5) Boil your clothing, especially your socks, daily when you have active skin disease. Do not wear one sock first on an in-

fected foot and then on a healthy foot. Dry, stretch, and soften your socks before replacing them in your field kit.

(6) Avoid *overtreating*. Follow instructions. Do not use too much medicine or apply it too often.

(7) Consider all your skin diseases as serious. Treat them *regularly, intelligently* and *patiently.*

[A. G. 062.11 (11–25–42).] (C 4, Dec. 28, 1942.)

BY ORDER OF THE SECRETARY OF WAR:

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# BASIC FIELD MANUAL

## JUNGLE WARFARE

## CHAPTER 1

## GENERAL

■ 1. GENERAL.—In jungle warfare the soldier fights two enemies: man and nature. Of the two, nature is often the more formidable. Troops newly arriving in tropical jungle areas experience a climate to which they are not accustomed and are exposed to diseases with which they are not familiar. These conditions impose a special responsibility on all commanders; they must assure themselves that their troops are adjusted to tropical climates and that the health and combat effectiveness of the command will insure the execution of the assigned mission under tropical jungle conditions.

■ 2. EFFECT OF CLIMATE.—Food which is not in sealed, airtight containers, and leather and web equipment are subject to the rapid deteriorating effects of damp heat. Both in garrison and in the field all commanders and mess and supply personnel must constantly seek to counteract the effects of this damp heat. Mess personnel must be especially watchful that food is not allowed to spoil and that storage areas are dry and airy. Equipment stored in garrison or camp must be kept dry. For this purpose, dry closets or storage rooms, warmed by artificial heat, are advantageous. The damp heat of jungle areas likewise requires that special care be given to all arms and other nonrustproof equipment which is in daily or frequent use.

■ 3. ROUTES OF COMMUNICATION AND LOGISTICS.—The denseness of jungle growth makes penetration slow and fatiguing, as new trails must be cut by hand labor, and only a few men can clear trail at a time. Where trails exist they will ordinarily be suitable for the passage of infantry, mounted men, or pack animals only. To convert the average jungle trail into a road over which wheeled vehicles can move will usually require considerable time and many hours of labor. On the other hand, rivers usually traverse jungle areas, and where water transportation and suitable landing areas are available, these constitute favorable routes of communication. Thus

jungle logistics will usually be based on three factors: first, river transport; second, the amount of food and ammunition that a man can carry; and third, the amount of supplies that pack animals if available can carry, minus transported subsistence needed by the animals themselves.

■ 4. SUPPLY AND EQUIPMENT.—*a.* Conditions of terrain and climate will have marked effects on tactical operations. In determining the feasibility of a desired tactical operation, supply considerations are often decisive. They will ordinarily assume a greater importance than in operations conducted in temperate climates or in areas where jungles are non-existent.

*b.* Weapons must often be limited to those which, with a due amount of ammunition, can be carried on the man or pack animal and which can be useful in the jungle. This frequently eliminates many supporting arms, and requires that tactics be based mainly on weapons which can be carried by hand and which do not use too much nor too heavy ammunition.

■ 5. PURPOSE OF MANUAL.—*a.* The leader who appreciates the logistic difficulties and limitations on fire which jungle conditions impose, and who correctly evaluates these conditions in the application of sound tactical doctrine will find that his jungle tactics are also correct.

*b.* The purpose of this manual is to furnish a guide for such appreciation of jungle conditions. Data contained herein have been secured from the collective experience of our own and foreign forces, and of commercial enterprise in tropical lands.

# CHAPTER 2

# HYGIENE AND SELF-PROTECTION



## SECTION I

## PREPARATION FOR JUNGLE SERVICE

■ 6. SANITARY INSTRUCTION OF TROOPS.—Officers and noncommissioned officers must have, and should give their men, a simple knowledge of the fundamentals of personal hygiene, preventive medicine, and self-protection against poisonous plants, noxious insects, and venomous reptiles if they are to maintain the health of their commands in the adverse climate and primitive environment of tropical jungles. Armies have been defeated and campaigns have been lost as a result of disease.

■ 7. ACCLIMATION.—Inhabitants of the temperate zones, when transported to the Tropics, require a period of physical adjustment to the increased heat and humidity and the greater power of the sun's rays before they can undertake long periods of hard physical exertion without discomfort and loss of efficiency. This period of gradual conditioning is usually from 6 to 8 weeks for seasoned troops and a correspondingly longer time for recruits.

■ 8. PHYSICAL CONDITIONING.—The hardships of jungle operations demand physical fitness and acclimation of individuals. The loss of body fluids due to perspiration, the increased concentration of the blood plasma and urine, the elevation of body temperature due to physical exertion at high external temperatures, the effects of the sun, and the cooling of the body surfaces by the relatively cool winds at night all tend to lower the resistance of the body. Unless the physical condition of a command is excellent, many casualties will result.

## SECTION II

## JUNGLE DISEASES—DESCRIPTION AND PREVENTIVE MEASURES

■ 9. INSECT- AND ANIMAL-BORNE DISEASES.—Insect- and animal-borne diseases are those in which the agent which causes the disease is transmitted from man to man, or from animal to man, by a bloodsucking insect or animal. The causal agent may be introduced into the blood stream or tissues of man during the bite of the infected insect, or it may be deposited upon the skin by the infected insect during the process of biting. The irritation resulting from the insect bite causes scratching and inoculation of the wound with the infectious material. It is necessary therefore for troops to exercise every precautionary and preventive measure described below in order to avoid infection. The carriers of these diseases are—

*a. Mosquitoes.*—(1) *Diseases transmitted.*—Malaria, yellow fever, dengue fever, and filariasis.

(2) *Description.*—The three groups of mosquitoes which are concerned in the transmission of disease are the Anopheles, Aedes, and Culex.

(*a*) The Anopheles group contains a number of species which transmit malaria. They bite during the night and may be especially active at dusk and at dawn. They may also bite, when disturbed, during daylight hours in shady, relatively cool, humid areas. They do not sing while flying. The adults have characteristic wing markings, long feelers, and, except for a very few species, rest and bite with the body at an angle of about 45° to the surface. Many species hold the hind legs in the air while biting.

(*b*) The Aedes group transmit yellow fever, dengue (or breakbone fever), and filariasis. They bite during the day and may also bite at night. They breed in water of practically any type; in rain barrels, cans, flower pots, gutters, cisterns, etc. The adults are characteristically marked with silver, white, or yellow bands and lines. They rest and bite with the body parallel to the surface.

(*c*) The Culex mosquito transmits filariasis. However, most species are nondisease transmitting but are biting pest mosquitoes. They bite at night, at dusk, and at dawn. They breed in cesspools, stagnant water, swamps, road ruts, and

also in and about habitations. The adults have no stripes on the chest or abdomen and, with few exceptions, rest and bite with the body parallel to the surface.

(3) *Preventive measures.*—(*a*) Any collection of water which persists for longer than 1 week may serve as a breeding place for mosquitoes. The species vary in their preferences for types and locations of breeding places. Most species prefer fresh, slow moving waters; some prefer brackish water; while others breed in gutters or water containers about habitations. Certain species prefer to breed in water containing organic material. The preference of the different species for sunlight varies greatly.

(*b*) Jungle warfare is largely one of movement, and any mosquito control measures used by moving troops will be dictated by the military situation. Concealment against observation from the air is of prime military importance, and therefore the clearing of vegetation can not be practiced except in limited areas. Hence control of mosquito-borne diseases will be based upon the protection of men from the bites of mosquitoes, the prevention of infection by the use of drugs to destroy parasites, the employment of repellent salves, and the inoculation with yellow fever vaccine.

(*c*) Headnets and gloves should be provided all personnel. These items of protective clothing are particularly valuable for personnel on outpost or similar duty, and during darkness when personnel are on duty which precludes the use of mosquito bars. Mosquito bars must be used by all personnel when sleeping out of doors or in a shelter not fully protected by screening.

(*d*) Unless in the execution of some military duty, personnel should avoid native villages and habitations at night.

(*e*) Commanding officers are responsible for the execution of mosquito control measures. Their decisions are based upon the military situation and the recommendations of Medical Department officers upon completion of mosquito surveys. For a detailed discussion of mosquitoes and mosquito control see FM 21–10.

***b. Ticks.***—(1) *Diseases transmitted.*—The following diseases are transmitted by ticks: Relapsing fever, Texas, Mexican, Central American, South American, and African types; Sao Paulo typhus; South African tick typhus; Indian tick typhus; Kenya tick typhus; Fievre butonneuse.

(2) *Description.*—Ticks as a class may be identified by the flat, oval body, small head and chest, and comparatively large abdomen. The legs are short and jointed, all being approximately the same size. The larvae or seed ticks have six legs; the nymphs and adults eight legs. Ticks do not immediately attach themselves after gaining access to the body of man. Even when the biting members are attached, infection does not usually occur until the tick has remained in place for 6 hours or longer.

(3) *Preventive measures.*—Frequent inspection of exposed skin areas and prompt removal of unattached ticks, and complete body inspection each morning and night when the military situation permits, with careful removal of free or attached ticks, will aid in the prevention of infection. Ticks should never be smashed or squashed on the skin. Covering the tick with a heavy application of saliva will cause the tick to free itself, and removal is then easily accomplished. If the tick is pulled out, mouth parts will be left in the bite. Pulling on the tick may cause squashing and infection. Huts, storehouses, native shops, and cantinas in tick-infested areas should be avoided. Abandoned huts, storehouses, barns, and corrals should be burned. Native domestic animals and pets should be avoided because of the possibility of unattached ticks transferring themselves to man.

*c. Sand flies (Phlebotomi).*—(1) *Diseases transmitted.*—Tropical sore (Cutaneous Leishmaniasis); Leishmaniasis Americana (Espundia); dum-dum fever (Kala-Agar); Oroya fever; and Verruga Peruanna.

(2) *Description.*—Sand flies are very small, slender, two-winged insects having long legs, hairy wings, long, hairy antennae, and shaggy abdomens. They are delicate, apparently disintegrating into gray dust when hit, but are vicious biters. Headnets and gloves furnish a degree of protection against them.

*d. Fleas.*—(1) *Diseases transmitted.*—The rat flea is the most common carrier of bubonic plague, endemic typhus, and other typhus-like diseases, although the fleas of other rodents may also transmit these diseases. Fleas also transmit Mexican Summer and Shop typhus and "Fievre Nautique."

(2) *Description.*—Fleas are small, wingless, brown or black insects with a laterally compressed body, small head and chest, large abdomen, and large powerful legs. The first pair of legs appear to be attached to the base of the head. The female is larger than the male flea.

(3) *Preventive measures.*—Since rats are the usual hosts of the flea, the elimination of these rodents is the best preventive measure. Food should be stored so that rats cannot get at it, and all garbage should be burned. In camps occupied for any length of time, trapping and poisoning should be practiced as soon as rats appear. See FM 21–10 for methods used in trapping. Rats (and their fleas) are usually in huts, storehouses, native shops, and cantinas, and especially on animal pets in these places. Abandoned huts and storehouses should be burned.

*e. Body lice.*—(1) *Diseases transmitted.*—The body louse and head louse may transmit endemic typhus fever, relapsing fever, and trench fever.

(2) *Description.*—Lice are small, gray, flattened, six-legged, wingless insects, with claws on the terminal joint of each leg.

(3) *Preventive measures.*—Infection is transmitted through the feces of lice, which is rubbed into the wound by the person bitten as he scratches to allay the irritation caused by the bite of the louse. To keep from getting lice, avoid close contact with individuals likely to be infested, and stay out of huts and cantinas.

*f. Mites.*—(1) *Diseases transmitted.*—Free living mites (Family Trombidiidae) are widely distributed throughout the world. They transmit tropical, scrub, Malaya, and Sumatra typhus.

(2) *Description.*—Mites are very small insects less than 1/25 inch in length. The body is oval, covered with fine hairs, and has four pairs of legs.

(3) *Preventive measures.*—Individual protection by means of repellants is the only control measure. Among the effective repellants are sulphur ointment, pine oil, and rotenone. Flowers of sulphur or powdered sulphur taken internally prior to entering the field and daily while in the field are also very effective. Ten grains daily will cause hydrogen sulphide to be excreted in the perspiration, which acts as a repellant.

*g. Bloodsucking flies.*—(1) *Diseases transmitted.*—Bloodsucking flies are vicious biters. The female of the Chrysops, Culicoides, and Simuliidae alone transmits diseases, while both sexes of Glossinae are disease carriers. Filiarsis is transmitted by midges and buffalo great flies, and filiarsis, tularemia, and African sleeping sickness are transmitted by the bloodsucking fly (and various species of Glossinae).

(2) *Preventive measures.*—Use of repellants, such as pine oil and rotenone; and protection by sand-flyproof screening, mosquito bars, headnets, leggings, and gloves are effective.

*h. Triatomidae (kissing bugs, assassin or cone-nosed bugs).*—(1) *Diseases transmitted.*—Triatomidae may transmit certain of the diseases mentioned in preceding paragraphs.

(2) *Description.*—They are large-sized, dark brown or black bugs, having a narrow, cone-shaped head, a long, oval-shaped abdomen, long legs, well-developed wings, and regularly arranged markings on the forward part of the chest, wings, and borders of the abdomen. They are common to tropical America, where they are called "barbero" (because they frequently bite about the face) and also "chincas voladoras" or flying bedbugs.

(3) *Preventive measures.*—To avoid these, keep out of huts, native shops, cantinas, stables, barns, or chicken houses; burn abandoned huts or barns. Do not sleep on the ground. For individual protection use headnets, leggings, gloves, and mosquito nets. At semipermanent or permanent camps or stations, buildings should be screened.

*i. Vampire bats.*—(1) *Diseases transmitted.*—Vampire bats on the island of Trinidad transmit rabies (hydrophobia) to human beings and animals. The virus of rabies is carried in the saliva of the infected bat.

(2) *Preventive measures.*—Antirabic treatment must be administered if rabies is known to be transmitted by this species of bat. Immediate first-aid treatment consists of cauterization of the bite wound with trichlor acetic acid or nitric acid. After cauterization, the wound is treated by the application of sterile tannic acid ointment and a tight compression bandage.

■ 10. WATER-BORNE DISEASES.—*a. Diseases.*—Typhoid fever, the paratyphoid fevers, bacillary (bacterial) dysentery,

amoebic dysentery, and cholera may be disseminated by contaminated drinking water. Infections from this source are prevented by the consumption of treated or purified water only.

*b. Preventive measures.*—(1) The water selected for human consumption should come from as clean a source as possible. When water is obtained from a stream, the water point for men should be above the water point for animals, the bathing point, the laundry point, vehicle washing point, and fords. On lakes, the intake point for drinking water should be so placed that wind and water currents flow away from the intake point and toward water points for other uses. The heavier organic or inorganic matter should be removed by filtering, straining, or settling. An infiltration basin may be constructed by digging a pit 6 or 8 feet from the edge of the stream or pond and 5 to 6 feet below the main water level.

(2) Boiling for 5 minutes renders water safe for human consumption. For large groups this method is unsatisfactory because of the time, fuel, and containers required.

(3) Chlorination is a better method and may be accomplished for the entire command by mobile purification units operated by the Corps of Engineers, or by organizations using water carts, small reservoirs, or the water sterilizing bag (Lister bag). For a discussion of the various suitable means of purifying water see FM 21–10.

■ 11. INTESTINAL INFECTIONS.—*a. Diseases.*—The principal diseases in this group which occur in the Tropics are amoebic dysentery, bacillary (bacterial) dysentery, cholera, food infection, food intoxication, helminthic infections (worms), paratyphoid fevers, protozoal dysenteries, typhoid fever, and undulant fever. These diseases are usually transmitted by the eating or drinking of contaminated food or water. Contamination of food is common. The contamination may be caused in vegetable products by contact with infected material during growth, such as human excreta used as a fertilizer. Contamination of any food may be caused by dirty utensils or by food handlers who have, or are carriers of, intestinal diseases.

*b. Preventive measures.*—(1) In the jungle, all perishables, both meats and vegetables, which cannot be stored in a

refrigerator below 40° F., should be cooked immediately upon receipt, except that frozen meat should be cooked immediately after thawing. All nonperishable food should be stored in vermin-free boxes or chests. All food should be kept as free of dust as possible, and every effort must be made to prevent contamination during transit.

(2) All foods should be served immediately after preparation. No left-overs should be served. Hard bread, tinned meat, and canned foods should be issued to troops in position unless hot food can be brought up in original containers. Because of the possibility of both contamination and the growth of an infectious agent prior to the time they are eaten, sandwiches or other prepared luncheons should not be issued for later consumption.

■ 12. SPECIAL TROPICAL OR EXOTIC DISEASES.—Yaws (Frambesia), lymphogranuloma inguinale, and granuloma inguinale are diseases which may be transmitted through sexual intercourse. The lesions of yaws are similar to those of syphilis. Lymphogranuloma inguinale is a virus disease. The initial lesion is so small that it usually passes unnoticed. Later the lymph glands in the groin become enlarged, break down, and ulcerate. Granuloma inguinale is usually limited to the genitalia and inguinal region, but may spread to other parts of the body. The lesions consist of large ulcerating areas which spread, gradually destroying the tissues as they advance.

■ 13. FUNGUS DISEASES OF THE SKIN AND HAIR.—*a. Diseases.*—Dhobie itch (epidermophytosis of the groin and body); athlete's foot (epidermophytosis of the feet); pinta, a fungus disease of the skin, characterized by pigmented patches; and trichosporosis, a fungus disease of the hair, are the principal fungus diseases.

*b. Preventive measures.*—These diseases may be avoided by personal cleanliness. The body should be bathed as frequently as possible. If insufficient water is available for a complete bath, the armpits, groin, and feet, at least, should be washed with soap and water daily, rinsed, and carefully dried. Care should be taken to dry between each toe, using enough force to remove the dry scales of skin. Foot powder should be used under the arms, about the groin, and between

the toes daily. If possible, socks should be changed daily. Socks should be washed in boiling water if practicable, then dried, stretched, and softened before being replaced in the field kit.

■ 14. VENOMOUS SNAKES AND SNAKE-BITE REMEDIES.—*a. Venomous snakes.*—Venomous or poisonous snakes may be differentiated from the nonpoisonous varieties by the following physical characteristics (see also app. IV):

(1) A lance-shaped head.

(2) The body (neck) narrows immediately behind the head.

(3) The body is heavy and narrows sharply at the vent.

(4) The tail is short and stubby.

(5) There is only a single row of scales on the abdomen (ventral surface of the tail) in rear of the vent.

*b. Snake bite.*—The strike of a poisonous snake is accompanied by an intense burning pain. Upon examination, two puncture marks indicating the entrance of the fangs will usually be observed; but only one fang may penetrate, resulting in a single wound. The distance between the fang marks gives a rough indication of the size of the snake.

*c. Treatment.*—Each case of snake bite must be treated as a serious one. The earlier that suction treatment and serum treatment are administered the more effective are the results. Pain and swelling are guides to the poisonousness and amount of venom injected. As far as practicable, suction should be applied to remove the venom from about the fang marks and the adjacent tissues. (See FM 21–10.) The proper antivenom should be used as soon as possible to neutralize the venom. Permanganate of potash, either crystals or solution, is useless and may cause more danger than the snake bite. Alcohol taken internally increases the circulation and causes more rapid absorption of the venom. Each case of snake bite is serious; treat it as such.

*d. What to do if bitten.*—(1) If possible kill the snake so it can be identified. This is important, for the type of snake must be known in order that the proper antivenom may be administered.

(2) Bare the part bitten, and if the bite is on an arm or leg, apply a tourniquet between the bite and the heart.

(3) *Do not run.*

(4) Call for assistance or proceed slowly to a place where assistance may be had.

(5) If a snake-bite suction kit is available, use it as directed in *e* below.

(6) If a member of a squad or other detachment is bitten, send a runner for a medical officer. Apply a tourniquet. Carry the man to an aid station and start suction treatment.

*e. Use of snake-bite suction kit.*—The suction kit consists of a tourniquet, a rubber bulb, two metal suction applicators, and a razor blade.

(1) The tourniquet is applied between the bite and the heart, when the bite is on a part of the body which permits the use of a tourniquet.

(2) Crisscross incisions about ½ inch long and ½ inch deep are made through the fang marks.

(3) The metal applicator is inserted in the suction bulb, air is squeezed out of the bulb, and the metal applicator is applied to one of the crisscross incisions. The bulb is permitted to fill with blood, serum, and air; is emptied and applied to the other crisscross incisions. This process is continued. Venom can be extracted from the tissues by suction as late as 3 to 5 hours after a bite. Multiple crisscross incisions should be made over the swollen area, especially at the advancing edge of the swelling, and suction applied.

(4) The tourniquet is released at the end of each 15 minutes. After circulation is restored for about 1 minute, reapply the tourniquet. The tourniquet should stop the return flow of blood (venous flow) but should never completely stop the flow of blood from the heart (arterial flow).

(5) If swelling develops above the fang marks, make crisscross incisions at the advancing edge and continue to apply suction to these incisions.

(6) In the absence of a suction kit the incisions over the fang marks should be made and wounds sucked with the mouth. Do not suck the wound if there are sores, cuts, cracks, or open breaks in the mucus membranes of the lips or mouth.

(7) Suction should be continued until the arrival of a medical officer, or until the patient can be moved to a first-aid station.

(8) Antivenom morphine and other medical treatment should be given by a medical officer.

## SECTION III

## PERSONAL HYGIENE

■ 15. KEEPING DRY.—*a.* The high atmospheric temperatures in the Tropics are usually associated with a high relative humidity. Heat regulation of the body is greatly assisted by the process of perspiring or sweating. Rapid cooling of the sweat-wet body surfaces is dangerous. Since the white man is sensitive to slight changes in temperature, the chilling, due to the rapid evaporation of sweat, will reduce body resistance and may cause infections of the respiratory tract, such as nasopharyngitis, sinusitis, bronchitis, and pneumonia. Intestinal disturbances may also result from chilling of the body surfaces.

*b.* Chilling of the body surfaces, especially the chest and abdomen, should be avoided. Wet clothing should be changed for dry as soon as possible, and, if practicable, the body dried during the change. If no dry garment or blanket is available it is less dangerous to strip, rub down, and stay naked until the wet clothes have dried, than to keep on wet garments; or a light, dry garment may be put on over the wet clothes, thereby reducing evaporation and the resultant chilling. If it should be necessary to keep on wet clothing, shelter from the wind should be sought.

*c.* The wearing of clothing wet with sweat for long periods may result in fungus infections or skin irritations such as prickly heat. Prickly heat or heat rash may be prevented by scrupulous cleanliness of the skin, by daily bathing in water to which baking soda has been added, by the use of borated talcum powder, and by daily changes of clothing.

■ 16. USE OF SALT.—Sweat results in the loss of fluid and salt (sodium chloride) from the body. Under ordinary conditions sufficient salt and fluid are eaten and drunk to replace the loss, but during heavy muscular exercise the loss of fluid and salt through perspiration may be excessive. Thirst is created, and further intake of water alone merely results in additional loss of salt. The symptoms of heat cramp may develop. These conditions may be prevented

by adding extra salt to the food and by taking salt tablets or drinking salt water during the period of heavy muscular exercise. Usually three 3-grain salt tablets each hour are sufficient to maintain the salt balance of the body during such periods.

■ 17. CLOTHING FOR JUNGLE SERVICE.—Clothing selected for jungle service should have a minimum capacity for heat absorption and a maximum capacity for the circulation of air to permit the evaporation of moisture (perspiration) from the body. The head should be protected from the rays of the sun by a hat which permits free circulation of air about the scalp and which is broad enough to protect the face and neck from the sun's rays.

## CHAPTER 3

## PRACTICAL HINTS FOR JUNGLE SERVICE

■ 18. CLOTHING AND EQUIPMENT.—*a.* Clothing and equipment receive hard usage in the jungle. Since replacement is often difficult, men must be trained to protect all articles and to clean, dry, or repair them whenever practicable.

*b.* Tight-fitting clothing is not desirable since such clothing is hot and restricts movement. The woolen olive-drab shirt, regulation khaki trousers, canvas leggings, and field shoes are suitable for jungle service. A heavy, loosely woven cotton shirt, when issued, may be used instead of the woolen shirt. The heavy cotton shirt has these advantages: It resists snagging and fungus rot better and is cooler than the woolen shirt. The tropical helmet, which sheds rain and permits free circulation of air, is a suitable headgear under ordinary conditions. For combat the steel helmet is worn. A headnet should be available for use at night or in areas of dense growth. Gloves which are impervious to mosquito bites should constitute a part of each soldier's equipment. Raincoats are impractical in jungle operations; however, a small poncho of lightweight, waterproof fabric is highly desirable during rainy weather. Before beginning jungle operations men should be provided with new shoes that have been well oiled to protect them against wet rot.

■ 19. SLEEPING.—*a.* To sleep in the jungle during the rainy season, a man should be off the ground and under a mosquito net. Using only the present issue equipment, the two-man, off-the-ground jungle bunk has proved serviceable although somewhat laborious to construct. This bunk is a platform 1 foot above the ground with its corners supported by four forked posts. A frame of 2-inch poles is laid in the forks, and across this frame are laid thinner poles. All are fastened together with vines. The platform is then covered with light branches and leaves to form a mattress. A blanket is spread over this to hold everything in place. On this platform are pitched the shelter tent and mosquito net, or in dry weather only the mosquito net. Improvised hammocks made of blankets, oblong pieces of canvas, or shelter halves may be used.

*b.* During the dry season, men sleep satisfactorily on the ground. They must, however, sleep under mosquito nets.

■ 20. FOOD.—*a.* Proper food is necessary, but the quantity of food required is not so great as is commonly believed. For jungle service, most food should be ready to eat without cooking, and all food carried should give the maximum food value for the minimum weight. Ordinary, undried foods contain more water than solids. Foods such as dried cooked meats, dried breads, powdered milk, quick-cooking oatmeal, rice, coffee essence, cocoa-malt, sugar, salt, and dried fruits and vegetables are light, easily carried and preserved, yet give ample nutrition, vitamins, roughage, and volume. Two pounds per day of such dry foods are enough for prolonged, hard marching. Precooked soy bean flour, if obtainable, is almost a balanced ration in itself.

*b.* To carry dried foods, rubber balloons such as those used for target practice are excellent, for they are completely waterproof, very light, fit into the smallest possible space, and allow the rations to be broken down into small sealed units.

■ 21. COOKING UTENSILS.—Cooking utensils need only include a light aluminum vessel for boiling and a spoon. The 1-quart canteen cup is useful both as a cooking and eating utensil. Most foods obtained in the jungle can be cooked over an open fire.

■ 22. MEDICAL CARE.—Medical care usually must be provided by the individual who must attend to his own scratches and bites at once. Since experience proves that if medicines are in sealed kits or are carried inside a pack, men will not use them early or often enough for preventive purposes, each man should carry, easily available, a small bottle of iodine with applicator top, a small roll of adhesive tape, and chlorine tablets. Small chlorine tablets for the treatment of drinking water if necessary, and salt (sodium chloride) tablets should be carried by each man. To minimize the greatest real dangers to a man lost in the jungle, each man should carry dysentery pills and atabrine or quinine. Effective insect lotions are desirable.

■ 23. TRAILS.—*a.* Trails are necessary for rapid progress in the jungle. The beds of swiftly flowing streams may be con-

sidered natural trails. Before starting on any jungle trip, one should study the trails shown on maps and inquire of natives for the best trails. Questions should be put to the natives in such form that they are forced to give information themselves, and cannot merely answer "Yes" or "No." For example, one should ask a native: "Where does this trail go?" and not "Does this trail go to San Juan?"

*b.* It is usually safe to assume that trails exist between important habitations even if none appears on maps. Often a circuitous trail will be better than the most direct one, because during the dry season trails are often shortened by use of ground that is swampy and impassable in the wet season. Many trails that traverse steep slopes are very difficult after rains, especially when pack animals have been over them. Maps cannot be depended on for accurate trail routes, since trails change due to erosion, fallen trees, and swollen streams. During the rainy season, vegetation rapidly overgrows trails which are not regularly used. Aerial photographs do not show trails covered by dense trees.

*c.* If unfordable streams are to be crossed, men must know how to swim, and animals must be trained to enter water and swim without hesitation.

*d.* Only in the complete absence of trails or streambeds should men crossing dense jungle attempt to cut new trails, since this work is both laborious and slow. (See par. 44.)

■ 24. EXPEDIENTS.—Jungle expedients require both originality and forethought. Of the many methods and devices that are almost always useful on a jungle trip, the following are of especial value:

*a.* Carry matches in a completely waterproof container, since otherwise perspiration alone will often make them useless.

*b.* Never go anywhere without a compass, preferably a lensatic or prismatic compass, which you know how to use.

*c.* Fish are easily caught in most tropical waters. A light hook and line often give quick results, but since many tropical fish are suckers, a light gig, such as a spear with barbed points, usually will yield more fish in less time. Quickest and surest of all fishing equipment are a few small sticks of black powder or other explosive with which to stun fish.

*d.* Next to his machete, a good pocket knife is a man's most useful possession in the jungle.

*e.* A watch should be carried not only to give time but also to help in estimating distances.

*f.* Running water is usually purer than still water, but all drinking water should be boiled or chlorinated. (See ch. 2.) Most mud or other solids in water can be removed by straining the water through a cloth or by stirring a small amount of alum into the water to cause the solids to settle.

*g.* If lost, remember that if a man goes down slope he will come to a stream, and that watercourses, besides furnishing a means of travel and a supply of water and food, almost always lead to inhabited valleys or costal regions.

*h.* Do not attempt to travel alone at night. Stop early enough in the afternoon to make camp, build a fire, and collect plenty of dead wood before nightfall.

*i.* To build a fire in wet weather, obtain shelter from the rain, and then split out the heartwood of dead limbs broken from trees. A small can of solidified alcohol is very useful for starting a fire if damp wood must be used for fuel. It will last for many days.

*j.* Vines can be used in place of string or rope for many purposes.

*k.* Edible fruits can usually be identified by signs of animals having eaten them. Avoid eating unknown fruits and plants except in dire emergency.

*l.* Sleep off the ground to avoid dampness, reptiles, and especially insects. Climb a tree if mosquitoes and other insects are too bad near the ground.

*m.* If possible travel with one or more companions.

*n.* Do not fear the jungle, for you should remember that if you keep relaxed and use your head you can live and travel alone for weeks in uninhabited country.

## CHAPTER 4

## WEAPONS

■ 25. GENERAL REQUIREMENTS.—Suitable weapons for use in jungle warfare, where observation and fields of fire are very limited, are short range arms easily supplied with ammunition and readily transported over difficult terrain. Experience indicates that the only reliable ground transportation for either weapons or ammunition in the jungle consists of either the individual soldier, carrying parties, or pack animals, as roads suitable for other types of transportation seldom exist.

■ 26. PRIMARY WEAPONS.—*a.* The primary weapons, that is, those which meet most completely the above conditions, are the rifle, automatic rifle, pistol, submachine gun, bayonet, hand grenade, and machete.

*b.* The pistol and submachine gun have the great advantage of using the same type of lightweight ammunition. The bayonet and hand grenade are the true infantry weapons of close combat, although the hand grenade is too heavy and bulky for ready transport in quantity. The machete, a tool indispensable to the jungle soldier, is also an excellent weapon for close combat.

■ 27. SECONDARY WEAPONS.—Secondary weapons are the light machine gun and 60-mm mortar. They are less maneuverable, less suited to instant use, and require ammunition more difficult to transport. In addition, where water transport or plenty of pack animals are available, the 81-mm mortar and the heavy machine gun will be valuable, both because of their effectiveness and because they can be carried by hand for limited distances.

■ 28. WEAPONS OF LIMITED USE.—Weapons of limited use include all other types of ordnance because they are difficult to transport, supply, and emplace, and because their effectiveness is restricted by jungle conditions. Field artillery guns are unsuited for use in the jungle. Pack howitzers, though more suitable in design and transport, are limited by their weight, bulk, and ammunition requirements. In addition to the limitations imposed on these weapons by their own bulk and weight and that of their ammunition, the dense

jungle greatly confines the burst of their projectiles. Also, the advantage of their long range will ordinarily be lost because of the impossibility of ground observation and the limited effectiveness of air observation. However, it must be borne in mind that in jungle regions there will be sabanas (open plains), areas in which jungle growth is not so dense, and villages and towns. In such areas and against defenders in villages and towns, artillery and other supporting ground weapons can be effectively employed. In preparing for operations in jungle regions, a careful study of terrain conditions in the probable area of operations will aid the commander materially in determining suitable armament for the forces involved.

■ 29. FIRE SUPPORT.—*a*. Combat aviation may be employed as a substitute for artillery and for infantry and chemical mortars in operations in dense jungle. Observation from the air, however, will be limited and difficult. To insure safety for friendly troops and efficient support by combat aviation, targets must be definitely located. This may have to be done by marking with pyrotechnics, or other visual means, the location of our own troops, and then giving by radio, if available, the bearing and distance of the target.

*b*. As indicated in chapter 5, terrain and jungle conditions in the area of operations will to a great extent determine the feasibility of employing artillery and other supporting ground weapons.

## CHAPTER 5

## THE ARMS

■ 30. INFANTRY.—*a.* Jungle fighting is performed largely by infantry. Combat is usually characterized by close fighting. Support of infantry by other arms will frequently be impracticable or impossible.

*b.* Prior to the initiation of operations in jungle areas, a careful analysis of the terrain must be made to determine the practicability of transporting and employing the various organic infantry weapons within each area of operations. Based upon this analysis and the mission, task forces are organized so as to assure maximum tactical mobility and combat effectiveness.

■ 31. CAVALRY.—*a. Mechanized.*—Except on roads, fairly dry trails, and in sabanas, mechanized cavalry is unsuited for employment in jungle terrain.

*b. Horse.*—(1) Horse cavalry will be confined usually to trails and open areas. Small horse cavalry detachments may prove especially effective for reconnaissance missions. However, in the rainy season even small cavalry units will so churn up the trails that any troops following, either foot or mounted, will find very difficult marching conditions.

(2) With suitable avenues of advance (trails, stream beds, or roads) the mobility of cavalry makes it especially suitable for surprise flanking or enveloping attacks.

(3) Native ponies capable of foraging in the jungle not only provide suitable mounts for cavalry service in the jungle but greatly simplify the problem of forage supply.

■ 32. ARTILLERY.—*a.* Trail conditions will usually prevent mechanized, motorized, or even animal-drawn guns from accompanying jungle columns. Pack artillery has the same limitations as horse cavalry, and in the jungle will seldom be able to use anything but direct fire because of lack of observation, while the effective area of burst of its 75-caliber ammunition will be limited by jungle growth. If, however, combat is expected in clearings such as sabanas, along river banks, or on beaches; if the trails are dry and hard, as in the dry season; and the supply of forage presents no great difficulty, pack artillery will be found especially useful.

When suitable roads or trails exist, both animal-drawn and motorized artillery may properly be allotted to the forces.

*b.* When artillery is employed, the proportions of the various types of ammunition carried should be modified to meet the conditions expected. Although 75-caliber shell is not an economical vehicle for persistent chemicals and smoke in open terrain, in the jungle such loadings are justified by the lack of heavier calibers and the fact that persistent chemicals and smoke dissipate far more slowly than in the open.

*c.* The limitation of fire to short ranges, and the general restriction of targets to those along relatively narrow trails and stream beds, will tend to make fire by battery or even by platoon unusual, and to cause sections to be attached to small infantry groups as accompanying guns.

■ 33. CHEMICAL TROOPS.—*a.* Only pack units will be practicable. These will have the same limitations as pack artillery, except that chemical mortar ammunition is lighter, and fewer animals will be required to transport the weapons and ammunition.

*b.* The ratio of smoke and of persistent to nonpersistent chemicals will be based, as in more open terrain, on whether the mission is offensive or defensive. Incendiaries will be useless except in the dry season and then only in sparse areas where the sun penetrates to the undergrowth. Chemical mines and smoke pots, which are placed by hand, should ordinarily constitute the bulk of chemical ammunition to be employed in the jungle. When mines or cylinders are available, barriers of persistent chemicals may be placed which will deny to the enemy the use of paths, trails, and areas. Depending upon the season of the year and the density of the vegetation, persistent chemicals may remain effective as long as 2 months, while nonpersistent agents will remain effective far in excess of the time normally expected.

■ 34. ENGINEERS.—Engineers should be attached to every jungle expedition. Their chief uses will be bridging, preparation of obstacles and demolitions or the clearing of obstacles, trail improvement and maintenance, water purification, and the siting of small, interlocking defensive works. As only pack transport will usually be available, engineer supplies will often be limited to demolitions and tools, but the jungle

itself will furnish material of great value in the execution of engineer tasks.

■ 35. MECHANIZED UNITS.—Mechanized units will have little or no combat value in the jungle itself. They can be effectively employed on sabanas or other open areas and against native villages. When mechanized units constitute part of a force operating in jungle areas, engineers should be attached to the mechanized elements.

■ 36. ANTIAIRCRAFT ARTILLERY.—The density of the jungle and the difficulty of moving antiaircraft artillery ordinarily will preclude its employment. Antiaircraft protection will be obtained primarily by concealment, supplemented by the fire of weapons which are suitable for firing against low flying airplanes. (See ch. 9.)

■ 37. AVIATION.—*a.* Observation aviation will have only limited usefulness in discovering and tracking an enemy moving in the jungle. However, observation aviation may be employed to identify and report the location of friendly columns or detachments, using prearranged signals of recognition. When artillery is employed, airplanes will often be the most effective means of adjusting fire.

*b.* Heavy bombardment will find few favorable targets in jungle warfare.

*c.* Medium and light bombardment furnishes jungle columns their best substitute for artillery support. The infantry's main problem will be to describe precisely to the bombers the target areas. Maps will often be inaccurate or nonexistent. Specific reference points on the ground will seldom be available. Therefore, special provision must be made for designating targets to the combat aviation, such as smoke shell fired from mortars.

■ 38. PARACHUTE TROOPS.—Parachute troops can be used to reinforce jungle columns or to seize and hold critical ground in advance of those columns, provided wide, shallow streambeds or clearings are available for landing. Parachute landings in the normal jungle terrain will not be practicable.

## CHAPTER 6

## NATIVE TROOPS

■ 39. GENERAL.—A commander of any expedition into a tropical country should at once take steps to avail himself of the assistance of natives of that area as guides, cargadores, scouts, and native auxiliaries. In any area when political feeling runs high or sectional differences exist, the enlisting of local assistance is easy. When a force has the mission of protecting the country against invasion, local authorities can usually be counted on to cooperate.

■ 40. GUIDES.—Carefully selected guides whose loyalty and integrity are unquestioned should be secured prior to the beginning of operations. In areas where United States troops are stationed permanently, arrangements should be made whereby these guides are employed during peace as well as in an emergency.

■ 41. CARGADORES, SCOUTS, AND UNITS OF NATIVE TROOPS.—Cargadores and scouts should be secured before operations begin. From among these it will be possible to select suitable personnel to form the nucleus of an organized force of native troops which will be of the greatest advantage in any operation over strange terrain. These troops will provide a force at the disposal of the commander which, for scouting, raiding, and harassing the enemy communications, will prove invaluable. Their familiarity with the terrain and their knowledge of the people and the language will compensate for limited training. The use of native troops, organized and controlled by the commander of the expeditionary force, not only will help to lessen any objection to the presence of our forces, but will strengthen solidarity against a common enemy.

## CHAPTER 7

## MARCHES AND CAMPS

■ 42. GENERAL.—*a.* Troops and animals must be conditioned by marches and exercises over jungle country. Since units will often march in single file over steep, narrow, and often muddy trails, men and animals require special conditioning. They must be thoroughly accustomed to full pack loads on heavy trails. The training of pack animals is fully discussed in FM 25–5. Combat unit pack animals are led. Pack train animals are ordinarily herded.

*b.* Clothing and equipment of men and the packs, saddles, and leather equipment of animals must be inspected for serviceability. Leather, especially shoes, wear rapidly in the jungle. If the leather equipment is old or worn it should be replaced before starting on a long march or period of extended service in the jungle.

*c.* The details of the march must be prepared in advance. Any march will be affected by the size of unit, capacity and number of trails, distance to be marched, season of the year, and method of supply and evacuation. It is preferable to move troops by daylight as concealment and cover are ample and avoidance of ambush easier. Night movements in the jungle are extremely difficult.

*d.* As a rule, parallel trails do not exist, and time and men are not available to cut long trails during the march. Thus, columns will usually march in single file, with reduced distances, on a time schedule. When the situation permits, animals should never precede foot troops, particularly over muddy trails.

*e.* Supply and evacuation by mule pack units should be made late in the afternoon or early in the morning while troops are still in camp. This permits pack units to move while trails are free of other troops and to maintain their normal gaits, the walk and amble.

■ 43. RECONNAISSANCE.—*a.* A thorough route reconnaissance prior to a jungle march should be made. If the tactical situation permits, a carefully selected reconnaissance party of officers and men, on foot or mounted, should move over the trail to check time, distance, and condition of trail; to find new routes around difficult areas; to mark trails and

designate streams to be bridged; to revise maps and to mark thereon camp sites, watering points, and rest areas. At the conclusion of the reconnaissance, the commander should be furnished with a trail report which will enable him to make his plans for trail construction and the march of the force.

*b.* If the trail reconnaissance report shows the route reconnoitered to be practicable, parties should be dispatched (if the tactical situation permits) to clear, widen, and mark the trails, and build bridges.

*c.* If the trail reconnaissance report shows the route reconnoitered to be impracticable, then a new trail must be located and cut. This, of course, requires additional organization and more time.

■ 44. CUTTING TRAILS.—*a. Permanent or semipermanent trails.*—(1) *Selection of route.*—In laying out a new trail, a careful map study should be made of the most direct route. With this as a basis, the trail should be laid out, considering these factors: existing trails, hills, streams, swamps, etc. All-year conditions of the terrain must be studied. High ground has less vegetation to cut but it also has less water. Streams should be crossed where the fords can be used the year round or where bridging operations are easiest. Low ground is to be avoided except during the dry season. Alternate routes may be used during dry and wet seasons. Prior to the construction or cutting of the trail, a reconnaissance party should follow the proposed route and definitely locate the trail on the ground. Inaccuracies in the maps will necessitate trail changes on the ground. At first a few men of the reconnaissance party blaze a small opening through the jungle on the route selected. This provides landmarks which the main construction party can easily follow as it progresses.

(2) *Organization of party.*—The main party should be generally divided into four groups:

(*a*) Trail-breaking group.
(*b*) Trail-clearing group.
(*c*) Construction group.
(*d*) Mess and supply group.

(3) *Functions of groups.*—The trail-breaking group armed with machetes cuts and clears all light underbrush and opens the reconnaissance party's trail. The trail-clearing group armed with heavier cutting tools (axes, saws, and machetes)

cuts and clears the heavier jungle. The construction group constructs bridges, corduroys the trail, and makes the necessary earth cuts and fills. The mess and supply group feeds and supplies the party. The speed with which the trail can be constructed varies with the size of the party, the width of the trail, and the density of the jungle. Often a satisfactory trail for foot and pack animal elements can be made by machete parties alone.

*b. Temporary trails.*—(1) In tactical operations it may often be necessary to cut temporary trails for the purpose of gaining connection between columns, to assist an attacking force in advancing against or enveloping a hostile force, or to provide a defending force with quick lateral communication.

(2) For the purpose of cpening temporary trails the leading cutters of the column break the trail; succeeding cutters widen and improve it. Speed and relief are gained by frequent rotation of cutters within each small unit or detail. Since these trails should be cut rapidly, selection of the route will be determined largely by the ease with which the trail can be cut. Slight detours will often gain time. To assure that the trail reaches the desired objective, a trail picker, with compass, should accompany the leading cutters.

■ 45. MARKING OF TRAILS.—Marking of trails is important. Trails change on the ground due to erosion, fallen trees, swollen streams, and quick growth of the jungle. Consequently, trails shown on maps several years old often are nonexistent or incorrectly indicated. Air photographs often will not show an existing trail in jungle areas. Markers are an assurance which relieves the command of constant worry. The methods most frequently used for marking are blazing trees with machetes, nailing flattened cans on trees, or marking with wooden signs. For night marching, whitewashed trees or white signs are excellent markers, but for immediate and temporary use, the tying of white string or cloth (bandage) along routes is sufficient.

■ 46. RATE OF MARCH.—The rate of march is greatly dependent on the condition of the trail. A well-cleared, marked, drained, and bridged trail will offer an easy avenue of travel, whether by single file, or column of twos, threes, or fours. However, troops usually march in single file, and this naturally

leads to elongation of columns as troops move up and down steep grades, through streams and mud. Rests should be frequent if the trail is muddy or steep.

■ 47. MARCH DISCIPLINE.—March discipline is especially important on jungle trails or routes, particularly to prevent straggling and the drinking of unchlorinated water.

■ 48. TRAIL MAINTENANCE.—Trail maintenance should be carried on during the march. As troops continue to pass over the trail some parts become deep with mud. Animals, particularly, churn trails until they become impassable for following units. It may be necessary to provide special details to cut new trails around bog holes, repair bridges, or corduroy muddy sections. No march should be undertaken without adequate trail maintenance equipment.

■ 49. SELECTION OF CAMP SITE.—When the situation permits, small detachments under an officer or noncommissioned officer should precede the column and select the camp site, lay it out, and partly clear it.

*b.* A good camp site should be on high ground for natural protection, drainage, fresh air, and breezes which make it free from insects. Even though high ground is desirable for drainage, sometimes water for cooking, watering animals, and bathing will make lower ground more desirable. In either case, cover and concealment are not a difficult problem in the jungle.

■ 50. OCCUPATION OF CAMP.—When practicable, the march should be completed at such time as to permit all units to prepare and occupy the camp area prior to darkness. Unit bivouac areas are designated well to the right and left of the trail, and clearing is begun as soon as troops arrive. Only the small trees and underbrush should be cut, so that a canopy remains overhead. Usually battalions are allotted a large area which is subdivided into company areas. The subdivision of areas is made down to include squads, so that units will be kept together and control will be easier. In order to avoid confusion and disorder should the force be required to move out of the camp area quickly or at night, squad rallying points should be designated by each squad leader. In addition, arrangements are made for the orderly assembly and movement of the whole command.

## CHAPTER 8

## RECONNAISSANCE

■ 51. RECONNAISSANCE.—*a.* Reconnaissance in any jungle area is a more difficult task than in the open. Observation is often limited to a matter of feet. Since movement through such areas is largely confined to trails or roads, reconnaissance likewise is directed primarily to these avenues of movement. Trained scouts and trackers, moving on trails or roads, may pass enemy troops concealed in the undergrowth but will not pass the signs left by their passage. Any movement along a jungle route will leave a track which can be read by trained personnel. Broken stems of bushes, dust on foliage, footprints, and hoof marks on or along the trail are indications of the passage of men. Cigarette smoke and the smell of burning tobacco linger much longer in the jungle than in more open areas. Broken or disturbed brush may indicate that individuals or groups have left the trail to seek concealment. Trained ears can detect movement which is concealed from the eye. The necessity for trained scouts in such operations is obvious.

*b.* The reconnaissance elements of advance guards and, even more important, flank guards (when parallel or lateral trails or open spaces permit their employment), as well as dismounted and mounted patrols, are important agencies of ground reconnaissance and information to the commander.

*c.* Prompt transmission of information may constitute a major difficulty in jungle operations. Consequently, every suitable means of signal communication must be made available to reconnaissance elements, since to rely solely upon foot messenger may mean costly delay. The radio telephone is perhaps the most valuable type of equipment, although the jungle may constitute such a shield as to preclude transmission. The use of previously determined relay points, where radio reception and transmission are known to be good, will often be advisable.

■ 52. SMALL PATROLS.—Small patrols of trained scouts are able to move through jungle areas, avoid enemy outposts, slip through hostile defenses and penetrate into enemy rear areas. These patrols will often constitute one of the most important

means available to the commander for gaining information of the enemy.

■ 53. AIR RECONNAISSANCE.—Air reconnaissance is almost useless in areas covered by thick tropical growth, since this growth provides a canopy which prevents air observation of the ground. However, aircraft is valuable for distance reconnaissance to check troop movements at entrances to and exits from jungle areas. Untrained or careless troops may disclose their whereabouts to air observation by their cooking fires, or by failure properly to conceal mosquito bars or white clothing which is being dried or aired. It is also possible to spot troops who carelessly move across clearings, through thinly timbered spaces, or along broad trails.

■ 54. RESPONSIBILITY OF HIGHER ECHELONS.—It is the responsibility of higher echelons to coordinate the reconnaissance measures of lower units and to provide for distant reconnaissance by aviation units or by mechanized or horse cavalry. It has been found by experience that native ponies, small, wiry and sure-footed, and requiring little or no transported forage, are particularly suitable for mounted reconnaissance in the jungle.

# CHAPTER 9

# SECURITY



## SECTION I

## GENERAL

■ 55. GENERAL.—In considering security in jungle operations it must be constantly borne in mind that there will seldom, if ever, be a time when a definite line will separate the area under friendly control from that in the hands of the enemy. There will be no standard front with its area of "no man's land." Consequently, it is necessary without exception that every unit in the area of operations provide itself with all-around protection.

■ 56. ALL-AROUND PROTECTION.—All-around protection must be provided for a unit moving through the jungles whatever its size. In most cases, vegetation of the densest type crowds up to the edge of the trail, precluding observation to the flanks. Since most jungle paths follow the line of least resistance, they twist and wind, making it impossible to observe any great distance to the front or rear. For this reason every movement of troops through the jungle area is constantly open to surprise attack from any direction. Bodies of troops accompanied by transportation are extremely vulnerable. To provide protection to front, flanks, and rear is most difficult because of the lack of visibility, which greatly reduces the distance at which the security detachments may operate without losing contact with the troops which they are protecting. All troops must be trained to act promptly, in accordance with a prearranged plan, to defend themselves against surprise attack while on route march through jungle areas. (See pars. 62 and 79.)

■ 57. CONCEALMENT.—The density of the trees and undergrowth, which makes security difficult, in turn lends itself to concealment and enables troops to be moved unseen by enemy observers, either ground or air. Units engaged in the attack can make flanking or enveloping marches without

their operation being discovered. Units forced to withdraw can do so with ease behind a thin screen of automatic weapons before the enemy is aware of their intention. Also, since rapid movement in this type of terrain is confined to roads or trails, any pursuing force may be greatly delayed by demolitions and obstacles, including mines and booby traps, which are placed across the route which he is following. The density of the vegetation and winding character of the road lend themselves to further delay and harassment of the pursuer by small mobile groups, which engage the head of his column and retire before the leading enemy elements come to grips with them.

■ 58. ANTIAIRCRAFT SECURITY.—All units provide for immediate protection against low-flying aircraft by using their own weapons which are suitable for fire against aircraft. The lack of suitable routes and the difficulties of terrain for the movement of antiaircraft artillery will often limit antiaircraft protection by ground fire to that of small arms. However, the concealment afforded by jungle growth provides a great degree of passive antiaircraft protection. (See FM 100–5.)

■ 59. ANTIMECHANIZED SECURITY.—*a.* The details of antimechanized security are discussed in FM 100–5 and FM 5–30. (See also ch. 5.)

*b.* The operations of mechanized units will ordinarily be limited to areas along the outskirts of jungles, to large open areas (sabanas) or occasionally to trails or roads. In jungle areas, antitank mines will be more easily transported and employed than antitank guns. However, where routes are suitable and the employment of hostile mechanized units is possible, the composition of the friendly force should include antitank-gun units.

*c.* Every effort must be made to assure the defeat and destruction of hostile mechanized elements. The general doctrines governing the employment of obstacles and demolitions are applicable in the jungle, and in addition the jungle itself is ordinarily a barrier to mechanized units. In any situation it should prove a valuable adjunct in antimechanized security measures.

## SECTION II

## ON THE MARCH

■ 60. SECURITY MEASURES.—*a.* In considering measures to be taken to insure a column's safety on the march in a jungle area it must be remembered that the enemy is, in general, confined to moving on the existing trails or roads. Therefore, to cover the trail or trails to the front and to reconnoiter the lateral trails coming in from the flanks will give protection against surprise from sizable groups of the enemy. However, it is necessary to be constantly on the alert for surprise attack by small groups in ambush. Distances between elements on the march should be much less than in open country. Special measures must be taken to assure contact between elements.

*b.* It must be standard practice for all columns to provide themselves with both advance and rear guards of appropriate size. Flank guards are sent out to cover lateral trails until the column has cleared. Ordinarily, because of the nature of the terrain, it will be impossible to have flank groups paralleling the column. However, when crossing open places in the jungle, the leading element must send patrols to the flanks to scout and protect the flanks until the rearmost element has passed through the clearing. To avoid being cut off, all elements detached from the column should rejoin the tail of the column without delay.

■ 61. AUTOMATIC WEAPONS.—In each element of the column the automatic weapons should be so distributed that it is possible to direct their fire in all directions. In the event of attack, designated units cover the front, rear, and flanks at once by observation and deliver fire promptly and effectively upon the attacker as soon as his position has been located.

■ 62. SURPRISE ATTACKS OR AMBUSHES.—Surprise attacks or fires from ambushes in the jungle are often delivered at extremely short ranges. Unless troops are trained to act promptly, many casualties will be sustained before the enemy is located. The majority of such attacks may be expected to be made by small parties. Prompt action by the unit in whose area the attack occurs will generally result in driving off or destroying the enemy. Should he be in force, the

counterattack will at once disclose this fact and enable the column commander to take proper action.

■ 63. ACTION AGAINST SURPRISE ATTACK OR AMBUSH.—To assure coordinated action within each unit, prior to the march subordinate elements should be assigned sectors or areas of responsibility. When fired into, troops at once leave the trail to gain concealment and cover, and each subordinate unit faces the sector for which it is responsible. The scouts of the unit covering the area from which the fire is received will indicate the area in which it is believed the hostile force is located and at once start the movement against the enemy. The scouts of the other units will move out into their sectors to feel them out and determine whether or not they are occupied. When the attacking force is driven off or destroyed, the column should at once reorganize, replace the advance guard or reassign sector responsibility, and resume the advance. Units which have been in contact with the enemy should remain between the column and the last known location of the attackers until the column has cleared, and then withdraw and rejoin the rear guard. Care must be taken to avoid being drawn into full deployment at every surprise attack, but a commander who fails to act energetically and promptly may be held up indefinitely and his troops rendered useless by the enemy's intelligent use of a few squads of aggressive infantrymen. At all halts the advance and rear guards should stay out and post march outposts covering the head and rear of the column. The main body should send out flanking groups to each flank to protect the column during the halt.

## SECTION III

## IN CAMP

■ 64. SELECTION OF CAMP SITE.—During the movement through the jungle the selection of a camp site will ordinarily be dictated by necessity. However, it is often possible to secure information of suitable sites by sending small scouting parties ahead of the column for this purpose. In active operations it is of primary necessity that the selected site give concealment from air observation. Clearings should be avoided since they may turn into death traps should the camp

be surprised and fired into from the edge of the jungle. The ideal site would be concealed in an isolated clump of vegetation with a clearing surrounding the camp area and with water at hand. In any event, a camp in the jungle must be protected by the same measures taken to provide for the security of any bivouac. Outposts must be placed to cover all avenues of approach, and the surrounding terrain kept under observation wherever possible. Since observation is always limited in the jungle, the personnel of the security detachment must use their ears to supplement their eyes in the performance of their mission. Men should be trained to listen for the normal night sounds of the jungle. Any cessation of these is fair warning that something is abroad which is disturbing the night life. The line of security detachments must be at sufficient distance from the camp to preclude the possibility of the camp being overrun before the troops can be formed for its defense. In the jungle, a very little work with the machete will build a ring of obstacles around a camp site which will greatly delay any enemy groups moving to the attack. It is fundamental that artificial obstacles must be covered by fire to be of value. Machine guns, if present, should be set up so as to cover these obstacles and should be sighted in before the troops are permitted to sleep.

■ 65. NIGHT PROTECTION.—In the jungle, movements at night are restricted largely to trails, roads, or stream beds. Security detachments must be so disposed that every avenue of approach to the camp is covered. Supports and reserves should be located so that they can quickly reinforce threatened areas. This may require the subdivision of the reserve of the outpost into two or more components. Because of difficulties in signal communication and the frequent lack of lateral trails, visiting patrols are of particular importance. All trails between the outpost line and the line of interior guards should be patrolled to prevent small raiding parties filtering through, gaining access to, and raiding the camp.

## SECTION IV

## COUNTERRECONNAISSANCE

■ 66. COUNTERRECONNAISANCE.—Our counterreconnaissance is aided by the same factors which operate to make our reconnaissance against the enemy difficult. It is so directed as to

deny to enemy patrols the use of the regular avenues of approach and to force them into the jungle, where they may be tracked, discovered, and destroyed. This can be done by patrolling thoroughly all avenues of approach and by constructing obstacles which will tend to divert enemy patrols into certain channels. The construction of light obstacles (cutting and intertwining or matting vines, brush, and similar growth) is easy in jungle areas and will give warning of parties passing through, or will cause them to detour and come into areas which are under surveillance. Obstructions built along the edge of the jungle and covered by small observation groups give the maximum coverage. (See FM 100–5.)

# CHAPTER 10

# ATTACK AND DEFENSE



## SECTION I

## GENERAL

**67. GENERAL.**—Jungle country materially affects those terrain factors which must be considered in all tactical operations—observation, fields of fire, concealment and cover, obstacles, and communications.

*a.* Observation, both aerial and terrestrial, is so limited by dense jungle vegetation that neither the attacker nor the defender can ordinarily expect effective fire support from field artillery guns or howitzers, or infantry mortars except in sabanas and open areas, and against villages or similar targets.

*b.* Vegetation so limits fields of fire as materially to interfere with the coordination of fires. This interference is of particular disadvantage to the defending force, since the power of the defense is largely based upon the systematic coordination of fires.

*c.* Jungle growth provides cover and concealment equally to the attacker and defender for the movement of troops and supplies. It provides concealment to the attacker in his approach to the defender's position.

*d.* The jungle is a natural obstacle which makes it difficult for the attacker to maintain centralized control of units larger than a battalion. As a consequence, combat becomes more and more the independent action of small units, whose conduct is determined by the missions assigned by higher headquarters and the intentions of the superior commander. Jungle combat demands the maximum in initiative, and acceptance of responsibility.

*e.* Jungle areas make it extremely difficult for the defender to deliver strongly supported and coordinated counterattacks.

*f.* Routes of communication will be scarce and of poor quality.

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## SECTION II

## ATTACK

■ 68. OFFENSIVE ACTION.—*a.* For successful offensive action in the jungle, special measures must be taken to insure maintenance of direction, intercommunication between columns, cohesion, and protection of flanks. Rigid formations cannot be held, but easily controlled formations should be adopted and maintained as long as the situation permits. All leaders must take every precaution to avoid confusion and loss of control. The characteristics of the jungle and the inherent difficulties of control in jungle warfare indicate that limited objectives will ordinarily be assigned to subordinate elements. Such assignment will enable each higher commander to maintain greater control of attacking units, and to regain control at various stages of the attack.

*b.* The success of an attack will often depend on a rapid and determined execution of a prearranged plan of action. Once an attack is launched in the jungle, the commander will have little opportunity to make major changes in disposition whereby the initial action can be influenced. This condition requires, ordinarily, that reserves be located in an area from which an estimate of the situation indicates their employment will be most effective. Since the lack of trails or routes will ordinarily make the lateral movement of reserves difficult, it will often be advisable to subdivide and locate the reserves in several areas.

*c.* Enveloping action by small units is more time consuming, but equally if not more effective in jungle than in more open terrain. Where trails or other avenues of approach exist for the movement of larger enveloping forces, particularly fast moving units, a successful envelopment of the hostile force has an even greater adverse psychological effect on the enemy than an envelopment executed in more open terrain.

■ 69. ADVANCE.—*a. Formation.*—(1) The formation for the advance must be carefully organized to assure the maximum of control and the maintenance of direction. (An important objective in training for combat in jungle areas must be thorough familiarity by all individuals with the means and methods of determining and maintaining direction.) The

formation adopted must be such as to prevent surprise by ambush, to provide all-around security, and to permit the rapid deployment of small groups.

(2) A compact formation is essential to control. Line formations are virtually impossible to maintain, since men get lost or stray in the underbrush, and soon degenerate into leaderless groups incapable of concerted action. Squad column is ordinarily the best formation for the leading elements of an attack through the jungles. The use of platoon column, or column of platoons, increases the difficulty of deployment and retards the development of the available firepower. However, platoon columns permit greater control and are often more desirable than squad columns until close to the enemy.

*b. Reserves.*—Reserves should follow the assault units closely. Leading elements moving forward against an enemy they cannot see are prone to exaggerate the enemy's strength. In such a situation, close support is essential to confidence and success. Excessive distances between echelons in jungle terrain make for poor control of units and may result in the absence of support at a critical time.

*c. Security.*—Patrols to the front and flank of each column are essential to its proper security. Such patrols must maintain visual and voice contact with the troops they are protecting, and where possible, with adjacent units.

*d. Maintenance of direction.*—Direction is maintained by means of compass bearing. Roads, trails, streams, and prominent landmarks are also used as a means of orientation. Short halts, to check direction, restore order, and establish communication and control, may be made on predetermined, well-defined areas or lines, such as a trail junction, cross trail, or stream. If such terrain features are not found in the area traversed, halts should be based on a prescribed time schedule.

■ 70. CONTACT WITH ENEMY.—*a. Conduct of leading elements.*—(1) Easily controlled formations should be maintained as long as the situation permits—ordinarily until first contact with the enemy. When hostile elements are encountered, scouts and patrols move against and endeavor to overcome the advance enemy detachments rapidly and with the least possible noise or disturbance. When resistance is

encountered which the scouts and patrols cannot overcome, the assault units deploy and both by frontal attack and maneuver seek to dislodge and destroy the hostile elements.

(2) Since combat in the jungle will ordinarily develop into numerous small independent actions, the initiative and troop-leading ability of lower commanders are of major importance. Having been given the objective of the force as well as its own objective, and knowing the intention of the higher commander, each lower unit must consider itself as a self-contained unit with a definite task to accomplish, without expectation of direct assistance from adjacent units.

(3) Troops must be particularly alert to locate gassed areas and obstacles, and, in avoiding these, to keep clear of areas or zones covered by enemy fire.

*b. Supports and reserves.*—(1) Supports and reserves must cover the routes of advance to prevent the leading elements from being cut off by the enemy. They are used to reinforce the leading elements, to envelop hostile flanks, and to meet counterattacks. After the leading units have passed through an area, reserves "mop up" that area. Small groups from the reserves may be sent into the enemy rear area to destroy communications and supply installations and to ambush small parties and supply convoys. Individuals selected for such duty must possess great physical endurance and be capable of thinking and acting quickly.

(2) When terrain is suitable, parachute troops may also be effectively employed against hostile rear areas. (See also par. 38.)

## SECTION III

## DEFENSE

■ 71. DEFENSIVE POSITION.—A defensive position should be so located as to intercept the hostile force, or offer such a threat to hostile advance as to require its reduction before the advance is continued. Because of the obscure situation which will normally obtain when forces are in contact in the jungle, the defending force should begin its organization of a position while out of contact with the enemy. The position should be on high ground and located behind natural obstacles, such as a river, a deep gorge, or an unusually thick portion of jungle growth which has few trails leading into the position.

Good supply routes to the rear should be available, and lateral communication for supply and rapid movement of reserves is desirable. Secure flanks are of extreme importance, since the cover and concealment provided by the jungle will enable the attacker to launch a surprise attack in flank or rear of the position, or send forces around the flanks to harass the defender's lines of communication and force a withdrawal from the position.

■ 72. ORGANIZATION.—*a*. The organization of a closely knit defensive area is fundamental in jungle defense. This defensive organization should prevent the unopposed penetration of small hostile forces and the attack of defense areas in flank and rear.

*b*. Initial dispositions should be such that all obstacles, and all trails or other approaches leading into or around the position are covered by security groups to the front and flanks. The commander must assure himself that avenues of approach over which a hostile enveloping force might strike his flanks or rear are adequately guarded. All approaches between the defensive position and the security detachments are patrolled to prevent hostile elements from breaking through the jungle and cutting off these security elements.

*c*. The limited observation, the difficulty of exercising control, the inability initially to develop systematic flanking fires with automatic weapons, and the lack of close support of artillery and assistance from adjacent units all tend to make jungle fighting a battle of individuals and small groups. Only by decreasing the intervals between defense areas and the space between individuals in the same defense area can these disadvantages be minimized. A corresponding reduction in distances between front-line defense areas and the organized localities of the supporting echelons must be made. The difficulty of moving large counterattacking forces expeditiously through jungle areas will ordinarily require that counterattacks be launched by units smaller in size than those employed in more open terrain. As a result, local supports should be smaller and more numerous than for a defensive position organized on open terrain. Their exact location is dictated by their mission—

(1) To support the forward defense areas by fire;

(2) To make local counterattacks to eject an enemy who has entered the forward defense areas; or

(3) To prevent further advance by the hostile force.

■ 73. PREPARATION OF POSITION.—The natural advantages which the jungle offers the defender in the preparation of a position can be developed by clearing fields of fire and by the preparation of obstacles and demolitions. This work should be undertaken concurrently so that the position is prepared for defense at all times.

*a. Fields of fire.*—While dense jungle limits the direction, range, and effectiveness of the defender's fire to such an extent that a protracted defense cannot be assured without clearing extensive fields of fire, yet by taking advantage of jungle conditions, restricted fields of fire can be made highly effective. In general, fields of fire in jungles are developed by first cutting lanes which can be enfiladed by automatic weapons. To obtain maximum fire effect, the lanes should be cut so as to flank the organized defensive areas, and some type of obstruction should be placed on the rear side of the lane to hold under fire any of the enemy seeking to cross the clearing. In the construction of fire lanes, so far as possible only the lower branches of trees are trimmed off, and only such trees as directly interfere with the fire are felled and cleared away. When fire lanes are so constructed, observation from the air is difficult. By carefully planning the jungle defenses and coordinating the construction of obstacles with the fire lanes, the attacking enemy can be held under fire either at the obstacle or when he attempts to seek an avenue of approach around the obstacle.

*b. Obstacles.*—(1) The jungle itself presents a feature favorable to the defender by providing on the ground much of the material necessary in the construction of obstacles. Against the movement of hostile foot troops, a common form of jungle obstacle, and the one most easily constructed, is the abatis (either of the dead or live form) reinforced by barbed wire. (See FM 5–15.) The difficulty of detecting a live abatis from the air makes it more desirable in many instances than a dead abatis. All types of obstacles, properly sited and constructed, in jungle areas have good concealment from air observation; therefore the location of these obstacles may remain unknown to the attacker until

he actually encounters them. Abatis of both types should be sited so that their lengths may be covered by fire along the side toward the enemy. It is particularly important that the abatis does not provide favorable cover and concealment for hostile forces seeking to work into the position.

(2) Streams may be formidable obstacles to an advancing force, particularly in the rainy season. Means for demolitions, for the destruction of bridges, and for quickly felling trees across trails should be available to a force which is defending or executing a retrograde movement. Mines for use against personnel should also be available for emplacement along trails or at river landings or water points which the enemy may be expected to use. Booby traps and ambushes will find frequent, effective employment. It can seldom be expected that transport for barbed wire will be available except by river boats.

(3) Due to the presence of large trees, dense undergrowth, and the resultant difficulty of maintaining direction, it must be expected that attacks by tanks in jungle country will be unusual. When tank attacks are made, however, the live abatis, constructed only from small trees and growth, is but a slight obstacle. On the other hand, a dead abatis, when properly constructed with large trees, may be made a serious obstacle to tank movement. The effectiveness of a dead abatis against tanks may be increased by cutting off the pliable ends of branches so that the tank is met by the ends of strong limbs.

*c. Equipment and time required.*—Each jungle soldier should be equipped with a machete. The normal engineer tools provided for a force preparing a defensive position should be augmented by the addition of axes sufficient to provide at least 25 percent of the command with them. A soldier trained in the use of the machete and axe can with these two tools completely clear 100 square yards of trail or about 200 square yards of fire lane in 5 hours.

■ 74. SECURITY AND HARASSING DETACHMENTS.—*a.* Security detachments should be placed along all avenues of approach to the defensive position to observe and delay the hostile approach. Patrolling must be active, along these approaches, between the security detachments and the defensive position, since the characteristics of jungle terrain permit the

easy capture or destruction of isolated advanced elements. After contact is made with the enemy, these security detachments must vigorously oppose any continued advance of the attacker, deny him the use of trails and other cleared routes of approach, and force him to cut his way through the jungle. This continued opposition by covering troops will conceal the exact location and strength of the defender and often will decoy the attacker into fire swept lanes and areas. The covering troops should also act to cut off and capture, or destroy leading enemy elements which have infiltrated between them and the main position.

*b.* Harassing detachments are suitably employed to cut the enemy's lines of communication, destroy his rear installations, prevent the supply of leading units, and attack the flanks and rear of enemy forces. It is this type of action which will demoralize the attacker, weaken his will to continue, and eventually enable the defender to assume the offensive.

## CHAPTER 11

## RETROGRADE MOVEMENTS

■ 75. GENERAL.—If the mission and situation do not require a defense in place, retrograde movement, particularly against a much stronger and aggressive enemy, may be the most suitable type of action, initially. Denying the enemy the use of roads, trails, and other avenues of approach, and harrying his lines of communication as he seeks to advance, may so harass, discourage, and exhaust his troops as to decrease materially their effectiveness and permit a decisive counterblow by friendly forces. Smoke may be a valuable agent for use during retrograde movements, especially in open or semiopen areas. It should be available in smoke pots and grenades. Persistent chemicals may be advantageously employed; however, their use must be carefully coordinated, especially with reference to the probable future action of the command.

■ 76. WITHDRAWAL.—Cover and concealment provided by the jungle permit easy withdrawal by units in contact with the enemy. Small groups familiar with the routes over which they are to move can readily disengage themselves. Such groups, placed on trails, can deny these trails to the enemy and force him to attack on a narrow front or cut trails around the delaying groups, thus gaining sufficient delay for the withdrawal of the main body. Withdrawal by daylight in jungle areas has many of the advantages of night withdrawal (concealment and cover) in more open terrain and permits greater control. However, personnel and equipment moving on wide trails easily observed from the air offer favorable targets to combat aviation. (See FM 100–5.)

■ 77. DELAYING ACTION.—*a*. In dense jungle areas delaying action will be executed principally on and near trails. In less dense areas, however, delaying action will require the occupation and defense of one or more delaying positions, since in these areas combat in the jungle will have generally the characteristics of woods fighting, and a defensive position will be necessary to assure effective delay. Successive delaying positions may be much closer together in jungles than in more open terrain, since the lack of observation will generally prevent the use of supporting artillery and mortars by the

attacker. The flanks of these positions must be protected against envelopment by the enemy.

*b.* Small, determined groups can delay forces many times their size; however, this type of combat in jungle areas is especially tiring. Consequently, units should be divided into groups so that they may alternate in the occupation of delaying positions and thus secure rest, while the enemy is kept constantly engaged.

*c.* Delaying groups, in addition to their normal equipment, should carry axes, land mines (both of the persistent chemical and explosive types), and demolitions. Obstacles to be of value must be covered by fire. In order to cause the maximum delay of animal elements, bridges should be destroyed and trees and other obstacles placed across all trails and roads as far forward from the delaying position as time and the situation will permit. Land mines should be placed in the jungle on both sides of obstacles, and in the obstacles themselves, to make their removal hazardous. Booby traps are especially suitable for this purpose. (See FM 21–45.) At points where the jungle is thin and is not an obstacle to the movement of foot troops, persistent chemical mines may be employed. Along the front of a delaying position as many obstacles should be constructed as time allows. These should be covered by fire and every effort should be made to place them so that the enemy will tend to filter into those areas where the delaying force can place the most firepower.

*d.* Because of the difficulties of supply and coordination, small well-trained forces, energetically led, are most suitable for the execution of delay in the jungle. Supports should be available in rear of leading elements along each trail. They may be used to extricate the leading elements from serious combat, to patrol the trails to prevent the leading elements from being cut off, and to replace them if they are captured. (See FM 100–5.)

## CHAPTER 12

## SPECIAL OPERATIONS

■ 78. NIGHT ATTACK.—The doctrines applicable to the execution of night attacks are enunciated in FM 100–5, 7–5, and 2–15. The characteristics of the jungle may frequently modify the application of these doctrines, as indicated below.

*a.* The number of columns into which the assaulting units are divided will ordinarily depend on the number of existing trails, within the zone of action, leading toward the enemy position. To cut new trails beforehand is a slow, noisy process, likely to warn the enemy of the impending attack. While small groups (such as a squad) of experienced men may be able to move quietly through the jungle, a large group moving through the jungle is likely to betray itself. While it may be possible for one or more small assault parties to approach directly through the jungle, it must be considered as axiomatic that night movement in the jungle will ordinarily be confined to trails, stream beds, or similar features, easily identified and followed.

*b.* Jungle conditions increase the difficulties of coordinating the time of attack of columns. If effected by a time schedule, ample allowance must be made for delays, even if the columns move on trails. Landmarks and easily distinguished features will be scarce or entirely absent. Because of the dense overhead growth, pyrotechnic signals may not be seen by all column leaders, and dampness and heat may make the pyrotechnics themselves undependable. Preliminary reconnaissance and a careful analysis of the conditions under which the attack is to be launched will permit the commander to effect the proper coordination.

*c.* Even more than in open areas, night attacks in the jungle must be conducted on a small scale and with limited objectives. Where suitable avenues of approach exist and mobile troops are available, a movement around the hostile position at night, followed by early morning attacks against hostile rear areas and installations may prove a major factor in the demoralization and defeat of the enemy.

*d.* Assault troops must depend on the bayonet, grenade, and machete. They cannot as a rule expect supporting fires from machine guns, mortars, or artillery. If the attack is

made over an open area in the jungle, it is organized and conducted as discussed in FM 100–5.

*e.* Preliminary reconnaissance, the use of guides, the wearing of distinguishing marks, and maintenance of secrecy and quiet are fully as important as in night attacks in more open terrain. The maintenance of quiet will be more difficult because troops moving over trails or through dense growths are more likely to make a noise than if moving on roads or through open fields. Since aviation and artillery will seldom be continuously present or in action, and since small arms fire will alert the enemy, there will be no artificial means of covering the noises made by marching troops. On the other hand, the assault will be in no danger of observation, even on moonlit nights, for they will not cross open skylines, fields, or highways.

*f.* When supports are placed in rear to cover a possible withdrawal, they must be close to the avenues of withdrawal. They should preferably be located along the trails, facing the trail and not the enemy position, so that they can quickly strike, with the bayonet, elements of the hostile force seeking to overtake the retiring assault units.

■ 79. CONVOYS.—*a.* Since supply will often depend on convoys, and the jungle terrain is especially suited to ambush and surprise attack, the protection of convoys must be given special consideration. The disposition of elements of the convoy guard must be such as to protect the convoy from capture, dispersal, or destruction. Mere delay will seldom be the enemy's object. Consequently, the advance guard will seldom be the most important of the convoy security groups.

*b.* In the jungle, attacks on the head or tail of a convoy will ordinarily be made along or astride the trail over which the convoy is moving, while attacks on the flank will be made either along cross trails or from the jungle itself. A flank ambush from the jungle, with detachments moving across the trail to intercept and halt the advance or retreat of the convoy, promises the enemy his best chance of surprise and success.

*c.* The ideal place for an ambush—the ground where the utmost provision must be taken against ambush—is a length of trail running along the side of a steep slope, the ambushing force itself being above the trail, so that the de-

fenders in turning to face the attack will have a precipice or a ravine in their rear, in which falling or stampeding pack animals will be killed or injured and their loads lost. A valley ringed by commanding hills, while excellent for ambush in more open country, will seldom be selected for such attack in the jungle because the dense growth allows no field of fire from the hilltops into the valley.

*d.* If the enemy is likely to use persistent chemicals, any low-ground trail, flanked by dense, damp, wind-breaking vegetation, is dangerous to a convoy and must be tested for chemicals by the advance guard. Where chemicals have been laid, the convoy must halt at the edge of the contaminated area until its extent and toxicity have been determined and, if necessary, a new trail cut around the area.

*e.* Considering the effect of jungle conditions on the handling of convoys, the following points are pertinent to convoy tactics:

(1) Advance and rear guards may be relatively smaller than in open country and their distances reduced.

(2) The element designated to furnish the flank guards must be relatively stronger, in spite of the fact that their patrols need not go so far to the flank as in open country, because the movement through the jungle will be slower and more tiring, and, unless nearly parallel trails exist, the patrols must be relieved more often than in open country. Where side trails cross or diverge from the route of march, detachments must be sent out on the side trails to stand guard until the convoy has cleared the junction. Favorable places for ambush (see *c* above) must be patrolled thoroughly before the convoy reaches such defiles. To accomplish its task properly, the entire flank-guard support, which furnishes the flanking patrols, must march well up behind the advance guard so that the flank patrols can be sent out early enough to protect the flanks of the column that follows them. Such patrols should be sent out at intervals, and as the rear of the column comes abreast of each patrol, the patrol should join the rear of the column. Should the flank-guard support become unduly depleted before camp is reached, it must be reinforced from the main body of the convoy guard during halts.

(3) Since attack on a convoy may come from any direction, the main body of the security detachment should usually march near the center of the convoy.

(4) In a long convoy small groups of automatic weapons should be located throughout the column. The fire which such a group can bring to bear at a moment's notice, at the point of first attack or ambush, may be decisive in beating off the enemy.

(5) Soldiers with experience in jungle attack and ambush of columns agree that the first few seconds of such an attack are generally decisive for one side or the other. When the first hostile shots strike into the column every man must throw himself to the ground, off the trail, and open rapid fire into the bush in the general direction of the enemy. Inexperienced men must be trained in such response until it becomes their involuntary reaction.

■ 80. AMBUSH.—The considerations which apply to the ambush of convoys in the jungle apply also to the ambush of any column and have been discussed in paragraph 79.

■ 81. ATTACK AND DEFENSE OF RIVER LINES.—The general doctrines of attack and defense of river lines are discussed in FM 100–5. Jungle conditions will usually modify the tactical application of these doctrines as follows:

*a. Attack.*—(1) Unless other considerations warrant the loss of time and surprise involved in cutting a number of trails toward the river bank, or unless such trails already exist, it may not be practicable to cross on a wide front. Reliance will be placed on speed, firepower, and surprise. Feints will be practical only on a more limited front but should not be omitted for that reason, because concealment afforded by the jungle can often be used to get small groups across secretly, and the confusion and uncertainty that small, harassing groups can cause may be of decisive importance in assisting the crossing of the main effort.

(2) Bridging and ferrying material must be obtained locally, as even a light ponton train can seldom accompany jungle columns. On the other hand, these columns will seldom include either heavy guns or vehicles but only such supplies as can be ferried across the stream. As a result, jungle bridgeheads must be prepared to hold during the time necessary to cut timber and to build large rafts and bridges for

the movement of additional troops, material, and supplies across the river.

(3) Usually, supporting fire of light weapons only will be available. These must be placed along the near bank itself in order to get observation. Weapons will usually have to be manhandled into position through the jungle, and time for such movements must be allowed unless the attacker depends solely on the surprise of a quick rush from the point where his trail route meets the stream, supported only by the fire of such weapons as can be quickly emplaced near the trail.

(4) When the river is of such width or the jungle growth is such as to permit air observation of the river and its banks, combat aviation can be effectively employed to assist the attacker.

(5) Where sabanas or open areas exist in rear of the riverbank held by the enemy, parachute troops may be used effectively to capture important points, block retreat or reinforcements, and generally to demoralize the defender.

(6) The bridgehead will ordinarily be much less distant from the far bank than in more open terrain.

*b. Defense.*—(1) In jungle warfare the main line of resistance will often be located along the riverbank since—

(*a*) The jungle and the usual lack of roads, trails, and other routes of movement are deterrents to rapid counterattack or movement of rearward reserves; therefore, it is undesirable to permit the enemy to gain a foothold on the defender's side of the river.

(*b*) Positions for supporting weapons can ordinarily be found only on or close to the riverbank itself.

(2) Suitable areas for crossings by the main attack forces will ordinarily be fewer in number than in more temperate climates and more thickly populated areas. However, the advantages of concealment and cover favor the crossing of small groups at any point.

(3) The defender must provide protection for his flanks and rear. The ease with which small, highly trained groups can cross and operate steathily in jungle areas to harass troops and damage or destroy installations requires that special measures be taken to protect against such hostile elements.

# CHAPTER 13

# SUPPLY AND EVACUATION



## SECTION I

## SUPPLY

■ 82. IMPORTANCE AND SPECIAL CONDITIONS.—*a.* The importance of supply and the special conditions affecting it in jungle warfare will limit, and may determine, the extent of operations, rates of movement, and the strength of forces employed. Available trails or roads, waterways, density of natural growth, seasonal conditions, and general terrain features will all have a direct bearing on the several types of transportation and therefore upon the functioning of supply. Requirements must be anticipated well in advance of actual needs. Careful planning is necessary to conserve transport facilities, and supplies of all classes must be closely supervised so as to exclude surplus and nonessential items.

*b.* Since the jungle ordinarily affords concealment against air observation and since the protection of convoys against ambush is more readily effected during daylight, commanders should take maximum advantage of daylight hours for the movement of supplies.

■ 83. TRANSPORTATION.—Transportation under jungle conditions is dependent upon the following means:

*a.* Pack units, such as the quartermaster troop (pack) (see T/O 10–118 and FM 25–5) afford reliable transportation for supplies under practically any conditions of jungle operations where trails exist or can be cleared. Equipped with the Phillips' cargo pack saddle, loads of all required types may be carried. A disadvantage of this type of transportation is that forage forms a relatively large proportion of its cargo.

*b.* Native pack animals and cargadores should be used when available, generally to supplement organic transportation. Uncertainty as to its limitations, and particularly as to its dependability, must be carefully considered. The employment of native labor and animals will conserve combat efficiency.

*c.* Air transportation is not feasible in thick jungle but may be used to excellent advantage when there are open clearings of sufficient extent to permit the dropping of supplies by parachute or the landing of supply planes. Where suitable water areas are available, amphibian planes may be employed to transport supplies.

*d.* Water-borne transportation is the most economical and often the surest means of supply. Streams and all waterways should be used to the fullest extent possible. Supplies transported over water routes are less liable to loss and damage; fragile food containers are safer, and the destruction caused by insects (particularly ants) is avoided. Boats, canoes, and rafts are to be employed at every opportunity. Where practicable, dumps should be established along watercourses to save transportation by men and animals.

*e.* Motor transportation is generally not practicable except on roads, or in the dry season on wide trails and in areas where the jungle growth is light and free of intertwined vines and large trees.

■ 84. RATIONS.—Rations will necessarily consist mainly of nonperishable items: canned meats, vegetables, and fruit; bacon; dried vegetables and fruits; and candy. Rice and hominy may be substituted for potatoes. Fragile containers (paper and cloth) should be reduced to a minimum to avoid loss and destruction due to insects, dampness, and breakage. To supply small reconnaissance or security detachments, small tin containers are desirable. For units which are to march in single file along narrow trails, it may often be advisable prior to the march to distribute components of the ration so that meals can be prepared by squads or individuals. Field bread, with hard crust, should be baked in individual loaves to facilitate handling and to prevent damage when transported by pack. The supply of food in small (preferably individual) containers is of particular importance where scarcity of water precludes sterilization of mess equipment. Field ration C fully meets this requirement.

■ 85. AMMUNITION SUPPLY.—Ammunition supply will become progressively more difficult in moving situations, especially where there are no waterways. As is true of other supplies, ammunition must eventually be carried by hand before it is

distributed. Therefore, a break-down to loads of 40 to 60 pounds will be necessary.

■ 86. WATER CONTAINERS.—Water containers of 5 or 10 gallon capacity will be required to carry water where conditions make it necessary to supply units at a distance from streams. (See also par. 10.)

■ 87. LOCAL PURCHASES.—Local purchases are useful in inhabited areas to supplement the limited diet of a field ration. Fresh food, particularly fish, fruit, and vegetables, are frequently available. Supply and mess officers should be prepared to make such purchases for cash, provided the necessary sanitary inspections have been made by authorized personnel of the Medical Department.

■ 88. CLOTHING.—Since clothing and particularly shoes deteriorate more rapidly in tropical jungle areas than in more temperate or cold climates, special provision must be made for adequate supply of these articles. Companies and similar units should carry a limited emergency supply of assorted sizes of shoes. (See pars. 17 and 18.)

■ 89. ENGINEER SUPPLIES.—Engineer supplies such as cutting tools, barbed wire, and demolitions should be available on call. It may be necessary to place these supplies so far forward that there will be risk of their loss, but the weight and extreme difficulty of transporting engineer materials make it imperative that they be moved by pack or water into or near areas where they are to be employed.

## SECTION II

## EVACUATION

■ 90. EQUIPMENT AND PREPARATION.—The usual equipment and property prescribed by Tables of Basic Allowances for units concerned with evacuation are suitable for operation under jungle conditions. All motor transportation capable of being used for evacuation in the jungle must be of the four-wheel-drive type, sturdily constructed, and with ample road clearance. Closed types of vehicles used in transportation of sick and wounded should be equipped with air-circulating fans. Provision must be made to protect against insects, personnel who are being evacuated.

■ 91. COLLECTION AND EVACUATION OF CASUALTIES.—*a*. The collection of casualties is greatly hampered by jungle conditions. It is important that subordinate commanding officers know and disseminate knowledge of the location of aid stations to their commands, for the flow of wounded must be along trails and stream beds.

*b*. Litter bearers are confined to cleared trails. The use of wheeled equipment (wheel litters, wagons, motor ambulances) probably will be impracticable, if not impossible, and evacuation by litter bearers or by pack equipment over greater distances than in more open areas will be necessary. Some casualties not able to walk can ride astride mules; others must be evacuated on mule litters. Boats, rafts, and ambulance barges are used when practicable. Natives can be advantageously employed in the operation of this type of transportation. A sitting patient can be carried pick-a-back in a sling for great distances by some native porters. Where open terrain or open water permits, airplanes and amphibian planes provide an excellent and rapid means of evacuation.

*c*. No one method of evacuation will suffice. It is rather by a combination of the means available that the collection and transportation of the sick and wounded will be accomplished satisfactorily. For the general methods and means of transportation of sick and wounded see FM 8–35.

## CHAPTER 14

## SIGNAL COMMUNICATION

■ 92. CARE OF SIGNAL EQUIPMENT.—The care of signal equipment is of great importance, especially in the rainy season. Prior to beginning jungle operations, every possible measure should be taken to dry out and then protect equipment. Electrical instruments require especial care. If waterproof covers for electrical instruments are not issued, they should be made from salvage material, such as raincoats and tentage. Signal equipment should never be placed on the ground. All pack animals carrying signal equipment must be led by hand. Frequent inspections should be made to determine that the equipment is travelling securely. When time permits at halts, the equipment should be examined and tested.

■ 93. MESSAGE CENTER.—Work at the message center must be done under adverse conditions. Message center personnel must be trained to work with headnets and gloves. Due to the heat, it is impractical to use closed tentage. Tents with sides rolled up or tent flies concealed from air observation offer suitable cover. Lights must be shaded or concealed to prevent hostile observation.

■ 94. MESSENGERS.—The messenger, foot or mounted, constitutes the primary and most reliable means of signal communication in jungle warfare. Except on roads, motor messengers will be of little value. Messengers should be carefully selected men, with a high degree of intelligence, courage, and aggressiveness. Their training should include instruction in jungle lore, trail knowledge, and the use of the marching compass. Trails blazed with code markings will materially assist messenger communication. Under severe jungle conditions and at night, foot and mounted messengers should be employed in pairs.

■ 95. RADIO COMMUNICATION.—The radio is an important secondary means of signal communication in jungle warfare. However, atmospheric conditions and jungle growth seriously limit its range. Light portable sets employing hand generators and fishing pole antennae are necessary. Because of their weight and bulk, the use of large and more powerful sets will be confined mainly to areas immediately adjacent to

trails and to rear areas. Continuous-wave signals provide greater range and are therefore preferable to voice or tone modulated signals. As soon as the tactical situation permits, exact locations where radio telephone sets will function should be marked with stakes.

■ 96. VISUAL COMMUNICATION.—Visual communication includes the transmission of messages by flags, lamps, panels, and pyrotechnics.

■ 97. SEMAPHORE AND WIGWAG FLAGS.—Semaphore and wigwag flags as a means of signal communication can be suitably employed in jungle operations. Flags may be obtained from available stocks, or improvised. Flag stations should be established in clearings on high slopes or in treetops, concealed if possible from frontal observation, and should have a uniform background against which the flag will stand out clearly. Against green, dark, or earth-colored background, the white flag with red center should be used. Against the skyline or a light-colored background the red flag with white center should be used. The distant station is the better judge of the background and should indicate the color of the flag wanted.

■ 98. SIGNAL LAMPS.—While it is fundamental that lamp signals are sent only from front to rear, situations will occur in jungle operations in which communication is equally feasible in both directions. Lamp stations should be concealed from the front, and will generally be located along straight stretches of trail. Either white or red beams may be used. In general, the white beam is visible at a greater distance by night; the red beam by day. In fog and smoke the red beam is more satisfactory for signaling. The distant station is the better judge of the more suitable color and should indicate the color desired. Each character of the international Morse alphabet must be sent at a speed consistent with the ability of the signal lamp to duplicate in light the electrical impulses imparted to it by the keyed battery source. This factor limits the speed at which each character may be sent. Increase in the speed of transmission is accomplished by reducing the interval between characters. If a lamp is broken or not available, any means of establishing flash communication may be used. A flashlight with an improvised reflector may serve the purpose, or a lantern may be covered by an upturned bucket,

the bucket being lifted to expose the light for long or short periods to represent dashes or dots.

99. PANELS.—Panels are useful in communicating with airplanes, but their use is limited. Cleared spaces must be found if normal panel signals are to be used. In areas of dense vegetation, panel spaces must be cleared. When carrying facilities are very limited, mosquito bars may be used in lieu of panels.

100. PYROTECHNICS.—The use of pyrotechnics is one of the principal means of visual communication. They are usually employed by front-line troops for signalling to the rear or to airplanes. Particularly in rear areas, pyrotechnics or hand mirrors may be used to attract an airplane. In jungle warfare the use of pyrotechnics is difficult in areas of heavy vegetation; smoke can be seen from airplanes with great difficulty. It is generally impractical to project ground signal cartridges through overhead foliage. The successful use of pyrotechnics depends on the use of clear spaces in lightly wooded areas or on hilltops. The pyrotechnic code used in jungle operations must be simple and contain signals which are especially applicable to jungle warfare. If pyrotechnic signals are to be used, lookouts should be detailed to watch for them.

101. AIR-GROUND COMMUNICATION.—To be successful in jungle warfare, air-ground signal communication must be based on thorough coordination of air and ground forces, completed before the beginning of operations. An air liaison officer should be present at the higher headquarters of ground forces. Pilots and observers should know the ground areas occupied. The range of radio is greatly decreased in the jungle, and it is often difficult for the observer in the airplane to hear radio signals from the ground.

102. SOUND COMMUNICATION.—Sound communication is used chiefly for alerting the command, for attracting attention, and for transmitting prearranged messages. The assignment of meanings to sound signals should be coordinated by the signal officer or communication officer of the higher headquarters and prescribed in the signal operation instructions of the command.

■ 103. WIRE COMMUNICATION.—Wire communication has a limited field of application in jungle warfare. Except along trails and roads or in open areas, it is slow to install, difficult to maintain, and more difficult to recover.

■ 104. PIGEONS.—Pigeon communication is chiefly of value in emergencies when all other means have failed or are not available. However, they may be advantageously used by distant reconnaissance units or other elements detached from the main force.

■ 105. COMMAND POSTS.—Command posts should be located on or near principal trails or river lines and near clear spaces. Central locations are preferable. Cover and concealment are important. (For further details of signal communication see FM 24–5.)

## APPENDIX I

## POISONOUS JUNGLE PLANTS AND TREES

■ 1. POISONOUS PLANTS AND TREES (EXTERNAL IRRITANTS).—Trees, vines, and shrubs which may cause irritation to the skin are divided into two classes: first, those provided with thorns, spines, or hairs which cause mechanical irritation and even penetrate the skin if brushed against or handled; second, those which secrete an irritating sap, gum, or tar which causes irritation and blisters if applied to the skin.

■ 2. POISONOUS OR IRRITANT JUNGLE PLANTS AND TREES OF THE WESTERN HEMISPHERE.—Numerous poisonous jungle plants and trees are found in the Western Hemisphere, the more common of which are listed below.

*a. Mechanical irritants.*—(1) *Spanish nettle (Ortega) (Urera baccifere).*—A small shrub. Edges of leaves are scalloped; stalk, soft and unarmed; the stems supporting the leaves and the flowers covered with stinging hairs; flowers in whitish clusters; grows in savannas in bright sunshine. The hairs readily penetrate clothing. The pain is intense; stinging and burning last for days.

(2) *Cow itch (Pica Pica) (Mucana pruriens).*—A long luxuriant, climbing vine with leaves, flowers, and seeds like that of edible beans. The seed pod when mature is covered with hairs the color of dark brown velvet. Cow itch grows in savannas and open areas in jungles among the stalks of guinea and other grasses. The hairs from the bean pod if brushed against when dry penetrate the skin and cause intolerable itching. The hairs may be carried by the wind.

(3) *Panama (Sterculia apetala).*—A very large tree with buttressed roots, and a smooth trunk with an enormous crown, growing to 40 or 50 feet. Leaves are 1 foot broad and shaped like a hand with outspread fingers; flowers are pink, and are borne in clusters. The fruit contains seeds resembling chestnuts, which are covered with hairs that penetrate the skin causing severe pain.

(4) *Acacia (Acacia melanoceras).*—A shrub which grows in swamps; height, from 5 to 10 feet. Bark is dark brown; thorns grow in pairs and resemble the horns of an ox; leaves are featherlike; flowers are yellow and in spikes; fruit is a pod. Ants burrow into the spines and attack if the plant is touched.

These ants, Pseudomyrma satan or fire ants, inject a strong acid which is very irritating.

(5) *Black palm* (*Astrocaryun polystachyum*) (*cana brava*).—A slender palm growing 30 or more feet high. The trunk and leaves are covered with long, flat, pointed spines; leaves are arched, feather-like and spiny; fruit is in a large cluster, red, one-seeded, and egg-shaped; flowers are green. The spines, if touched, readily penetrate the skin and break off. Irritating wounds are caused which fester. The spine must be removed surgically.

*b.* The following trees and shrubs secrete an irritating or blistering sap, oil, or gum:

(1) *Beach apple* (*Manchineel*) (*Manzanillo*) (*Hippomane mancinella*).—Grows along seacoast. Leaves resemble those of the pear tree, and are smooth and green with notches like saw teeth; bark is smooth; flowers green and in spikes; fruit when ripe looks like a crab apple. The sap or juice of this tree will blister the skin and cause sores which heal with difficulty. Salt water is a specific treatment. Since this tree grows near the seashore, immediate immersion in sea water will counteract the effects of the sap. Death may result if the fruit is eaten.

(2) *Mango* (*Mangifere indica*).—The mango has leathery, green, lance-shaped leaves; rough, gray-brown bark; and large trunk. Spread of branches is over 100 feet; flowers are pinkish white, and grow in clusters; fruit is heart-shaped, pink and yellow in color, and is widely eaten. Sap of tree and juice of fruit are irritating to skin of some people who, because of allergy to the sap or fruit, develop a rash by merely walking or resting under the tree.

■ 3. POISONOUS OR IRRITANT JUNGLE PLANTS AND TREES OF THE PHILIPPINE ISLANDS.—*a.* Among the mechanical irritants are the following:

(1) *Kaong* (*Arengo pinnata*).—A palm commonly found in forests and open regions, and along valleys and creeks, up to altitudes of 1,500 to 2,000 feet above sea level. The plant reaches a height of 30 to 50 feet and has a trunk diameter of 10 to 15 inches. It is characterized by long, feather-like leaves, each 15 to 25 feet long. The base of each long leaf is covered by black fibers. Each long leaf is composed of 90 to 100 pairs of linear leaves, 3 to 5 feet long. These smaller leaves are lobed at the tip and notched or ear-shaped at the base. The fruit of this palm consists

of clusters of green nuts which turn yellow when they mature. It is this fruit which causes irritation to those who do not know how to handle it. The covering of the fruit contains numerous microscopic needle-like hairs. When handled with the bare hands, especially when the fruit is decaying, the hairs cause irritation of the skin.

(2) *Dumayaka* (*Arengo tremula*).—This palm is similar in appearance to the kaong. It is smaller, however, seldom growing higher than 12 to 14 feet. Small, needle-like hairs on the fruit are the cause of skin irritation. Dumayaka is found in abundance in southern and southeastern parts of Luzon, in Mindoro, and in Davao, Mindanao. It is often found in thickets and secondary forests at low altitudes; it is common along the seashore.

(3) *Fishtail palm* (*Pugahan*) (*Caryota cumingii-Lodd*).—This is a large palm reaching a height of 50 feet or more. It can be easily recognized by the tip of the small leaves, which have the appearance of fishtails. The fruit is covered with needle-like hairs or crystals similar to those of the kaong, and is dull yellow when ripe.

(4) *Lipang-kalabao* (*Laportea meyeniana*).—This plant is a stocky tree (sometimes a coarse shrub) which commonly reaches a height of 15 to 25 feet. It is characterized by a whitish trunk, slender branches, and thick leaves which are crowded near the ends of the twigs. The leaves are short, pointed at the tips, rounded at the base, and darker green above than below. Along the edges and lower surfaces of the leaves and on the leaf stems are numerous minute, stinging hairs. When the leaves are touched only slightly the skin poison is injected.

(5) *Lipang morado* (*Laportea subclausa*).—This plant is an erect shrub or small tree, reaching a height of 10 to 15 feet. Its leaves are leather-like and long-stemmed; from a rounded base they narrow gradually to a sharp point, and are scattered along the few branches of the tree. Its flowers are bluish. Numerous stinging hairs are found along the edges and veins of the leaves and on the stems. Contact with these hairs produces severe irritation of the skin.

(6) *Lipa* (*Laportea luzonesis*).—This tree grows wild and in abundance among the heavy undergrowth. It ranges in height from 6 to 15 feet. It is very similar to the papaya tree in appearance, although the leaves are smaller. Both

trunk and leaves are covered with fine, white, velvety hairs which are extremely irritating to the skin.

(7) *Nipai* (*Mucuna negricans*).—The nipai is a twining vine, very common in thickets and second-growth forests and along creek banks at low altitudes. It can be easily identified by its trifoliate leaves and dark purple flowers. It produces wrinkled, hanging pods which are covered with sharp-pointed, bristle-like hairs, some of which have barb-like protuberances along their sides. Irritation from the nipai is due more to the piercing of the skin by the stiff hairs and barbs than to the injection of irritant formic acids.

(8) *Dilamo* (*Tragia hirsuta*).—The dilamo is a vine which climbs on trees, shrubs, or bushes. The leaves grow far apart. They are 3 to 5 inches long; 1 to 2½ inches wide. Both upper and lower surfaces are shiny, the upper olive green in color, the lower somewhat paler. The base of the leaf is rounded and deeply notched where it joins the stem; the tip has a rather broad point, but is sometimes rounded, with a sharp point protruding (apiculate). The stinging hairs on the leaves and tender stems cause irritation on contact.

*b.* The following trees and shrubs secrete an irritating or blistering sap, oil, or gum:

(1) *Pungapung* (*Amorphophallus campanulatus*).—This plant, which grows to a height of about 5 feet, is easily recognized by its wrinkled, greenish, rounded stalk. The pungapung is a perennial herb which grows from a bulb (corm). During November and December the leaves turn yellow; during the following dry season the stalk dies. In April or May the plant is in bloom, having large purple flowers which give off a very offensive odor (resembles putrid meat). The juice found in the stalk and in the corm causes instant skin irritation.

(2) *Ligas* (*Semicarpus cuneiformis blanco*).—The ligas is a shrub or small tree which reaches a height of 15 to 25 feet. It is easily identified by the presence of dry, black sap along the trunk. The leaves, about 1 to 3 inches long, and whitish on the under side, are somewhat crowded at the ends of the twigs. It has small (about ½ inch long), fleshy, pear-shaped, purplish fruit which is edible. The sap of the tree is a violent contact poison to many persons, whereas it has no effect on others. On contact with the skin it causes painful swellings and minute ulcers resembling the effect of

poison ivy. This plant is common throughout the Philippine Islands. It is found in open places, in second-growth forests at low altitudes, and in dry thickets.

(3) *Buta-buta* (*Excoecaria agallocha* (*buta*) (*alipata*).—The buta-buta is a shrub or tree which may reach a height of 25 feet. The leaves are oval and 2½ to 5 inches long. The flowers are characteristic with ½-inch to 1-inch long racemes. The bark produces latex, a milky, white fluid. This fluid is a skin irritant. It causes severe pain if it gets into the eyes; blindness may result. If swallowed, the latex may cause vomiting; if it is retained, it may cause inflammation of the intestines, followed by bloody diarrhea. Approximately 1 tablespoonful swallowed, or ¼ cc injected intravenously, will ordinarily prove fatal to a person weighing 100 to 110 pounds. Applied externally, the fresh juice will usually produce blisters.

(4) *Kamanday*.—In Panay, the kamanday tree is known as hilegoynon. It is common along the Panay and Tolur rivers and in the mountains of Panay. The sap of this tree is so poisonous that its entry into the body of man or animal will prove fatal.

(5) *Dalit* (*Antiaris toxicaria*).—The dalit is a medium-sized tree which reaches a height of about 50 feet. Its leaves, 6 to 8 inches long and 2 to 3 inches wide, are pointed at the tip and obliquely notched at the base; the lobes are of unequal size and shape, and shiny on the upper surface. This tree is generally found in isolated areas in northern Luzon and in the provinces of Cagayan and Apayao. It is also found on the islands of Mindoro and Guimaras. The sap is a virulent poison.

(6) *Abuab* (*Lophopetalum toxicum*).—The abuab is a fairly large tree which reaches a height of 60 feet or more. The trunk is cylindrical, slightly buttressed at the base. The bark is either white or brown and rough with short vertical cracks. The crown is wide spreading with horizontal branches. The leaves are smooth, pale underneath, and about 8 inches long by about 3 inches wide. The flowers are greenish white. The fruit is leathery, thick, three-winged, and approximately 5 inches long by 1 inch wide. The abuab flowers from February to April. The fruit, which is borne at intervals of 2 to 3 years, matures during July and August. The bark of this tree yields the poison known as saponin, a physiologically active substance; poisonous even in small quantities.

## APPENDIX II

## POISONOUS JUNGLE FOODS

■ 1. CASTOR BEAN (RICINUS COMMUNIS).—*a. Description.*—A shrub which in rich soil may reach a height of 8 to 10 feet. The leaves are smooth and resemble a hand with fingers outstretched; flowers are in tufts and are covered with brown spines; fruit is the castor bean which contains ricin which may cause diarrhea when eaten.

*b. Treatment.*—Treatment though rarely necessary is based on the symptoms.

■ 2. SAND BOX (HURA CREPITANS) (JAVELLO).—*a. Description.*—The trunk has spines resembling those of a grater; leaves are heart-shaped and hang on a long leafstalk; fruit is shaped like a small muskmelon and contains in its cells a dozen or more seeds which explode when the fruit is ripe. The juice and seeds are violent purgatives.

*b. Treatment.*—Force fluids; allay purgative action with paregoric or opium.

■ 3. BEACH APPLE (MANCHINEEL) (MANZANELLO) (HIPPOMANE MANCINELLA).—*a. Description* (see app. I).—The fruit when ripe is red and resembles a crab apple. When eaten, causes swelling of mouth, throat, and larynx; may cause death.

*b. Treatment.*—Wash mouth with salt water (tablespoon of salt to pint of water). Wash stomach with salt water. Give adrenalin 1–1000 subcutaneously to reduce swelling. A tracheotomy may be required if swelling of glottis is marked.

■ 4. MANGO (MANGIFERA INDICA).—Swelling of mouth and face may occur in those sensitive to juice of this fruit. Treat by subcutaneous injection of adrenalin 1–1000. Epinephrine may be given by mouth.

■ 5. CASHEW (ANACARDIUM ICCIDENTALE).—*a. Description.*—Grows along roads and in dry bare places. Leaves are green, egg-shaped, and 8 inches long by 4 inches wide; bark is grayish brown; flowers are in groups and are purple; fruit is bright red when ripe. Suspended below the fruit is a kidney-shaped nut which is edible when roasted. As this nut contains an irritating oil which will blister skin, care

must be taken in roasting not to permit the hot gases to come in contact with the skin.

*b. Treatment.*—If blistered, treat with a hot solution of magnesium sulphate or calamine lotion.

■ 6. AKEE (BLIGHIA SAPIDA).—*a. Description.*—A tree with smooth, oblong leaves 6 inches long arranged on each side of stems. Blossoms are greenish white and in clusters; bark is smooth, greenish brown; fruit is pale red, cracks open when ripe, revealing black seeds. The fruit is poisonous if eaten raw, causing abdominal cramps and vomiting. It may be eaten if prepared by an experienced cook. Unopened fruit should be avoided.

*b. Treatment.*—Give an emetic and wash out stomach with alcohol and water or whisky and water. Administer alcohol or whiskey immediately upon obtaining history of having eaten green or unopened akee fruit.

■ 7. HUEVO DE TIGRE (THEVETIA NITIDA).—*a. Description.*—A small shrub with smooth bark and trunk about 5 to 6 feet tall. Leaves are glossy green; flowers are yellow; fruit, about size of cherry, is blood red. The fruit is poisonous, containing thevetine, which is a narcotic and heart depressant. When taken internally the seeds cause violent vomiting, embarrassment of respiration, and may cause cardiac paralysis. The Indians use the juice of the fruit to relieve toothache.

*b. Treatment.*—Give castor oil to eliminate seeds from gastro-intestinal tract. Use artificial respiration if breathing is difficult. Cardiac stimulants should be given if there are symptoms of cardiac failure.

■ 8. STRYCHNINE CAJURA (STRYCHNOS PANAMENSIS).—*a. Description.*—A vine resembling the sweetpotato vine; leaves are smooth, egg-shaped and lance-shaped; flowers are white; fruit is like a berry with a smooth skin. The strychnine is found at the root.

*b. Treatment.*—Administer large doses of sodium amytal. Give chloroform to stop convulsions.

■ 9. CURARE (STRYCHNOS TOXIFERA).—*a. Description.*—A vine similar to Strychnos panamensis but covered with short hairs. The poisonous element is contained in the bark of the plant.

*b. Treatment.*—None for the effects of curare. For the

strychnine effects treatment is the same as for Strychnos panamensis.

■ **10. BITTER CASSAVA (MANIHOT UTILISSIMA).**—*a. Description.*—Semi-shrubby perennials with large, fleshy, cylindrical, tapering roots as much as 3 feet long and 6 to 12 inches in diameter. The plant grows 5 to 10 feet high; leaves are long-stalked with the blade divided nearly to the base into from 3 to 7 long, narrow segments. The sap of the root contains hydrocyanic acid and is highly poisonous until root is cleaned, dried, and shredded.

*b. Treatment.*—If the patient stops breathing, or breathing becomes shallow, start artificial respiration. Administer caffeine and heart stimulants. The patient should be kept quiet and treated by a medical officer.

## APPENDIX III

## POISONOUS WEAPONS USED IN JUNGLE

■ 1. POISONOUS WEAPONS.—Natives in many parts of the world apply poison to the barbs of arrows and spears. The poisons employed vary, but consist of three general groups:

*a.* Plant poisons.

*b.* Snake venom and poisons from various insects, especially beetles.

*c.* Bacteria such as tetanus bacilli and the bacilli of gas gangrene.

■ 2. POISONS USED.—*a.* South American arrow poisons are all obtained from species of strychnos, the active principle of which is curare.

*b.* The African aborigines use Acocanthera (Ovabaio) Strophanthus and Adenium. The active principle of Acocanthera is the glucoside, ouabain; that of Strophanthus is strophanthidin and ovabain. All are powerful cardiac depressants and can cause death within a few moments.

*c.* In Malaya, Sumatra, and Borneo the sap of the upas tree, Antiaris toxicaria, is used. The active principle, antiarin, is a cardiac depressant. Aconitum and strychnos are also used. These drugs are both cardiac and respiratory depressants.

*d.* The venom of poisonous snakes and insects is used separately or added to poisonous vegetable alkaloids.

*e.* The bacteria used as arrow poisons are obtained by dipping the arrows into decaying organic matter.

■ 3. TREATMENT.—Poison arrow wounds should be treated in the same manner as snake bites. A tourniquet should be applied immediately; the arrow head withdrawn, or an incision made so as to extract it, and the wound thoroughly flushed with hypertonic salt solution, and washed out with an oxidizing solution. Since the type of poison used is not always known, treatment will be symptomatic. Antitetanic serum and antigas gangrene serum should be given in prophylactic doses as a precautionary measure.

## APPENDIX IV

## POISONOUS JUNGLE SNAKES

■ 1. SNAKE POISONING.—Snake poisoning is the train of symptoms observed after the venom of certain species of snakes is injected into the tissues of the victim. The symptoms vary from death to trivial effects, and can be classified into two main groups:

*a. Colubride snakes.*—Death occurs as a result of the poison affecting the nervous system and the center which controls breathing. This poison kills by paralyzing these two vital systems. The heart itself is stimulated and not directly affected until the terminal stage, when the breathing becomes too inadequate to sustain life.

*b. Viperine snakes.*—Local symptoms are marked at the site of the bite—pain, oozing of blood and serum, and thrombosis (clotting of blood in veins), followed by gangrene. Death occurs in one of the following ways:

(1) Immediately, from thrombosis, if the poison is injected into a vein or a large dose is given.

(2) In a few hours, due to heart failure from paralysis of the brain centers.

(3) In a few days, from secondary bleeding due to the action of the poison in preventing blood clotting.

(4) From secondary infection of the gangrenous area at the site of the bite.

■ 2. SNAKES.—*a. Colubride.*—This group includes snakes found both in the Old and the New World. The description of each species given below includes the habitat of that species in the Western Hemisphere and the Philippines.

(1) *Cobras.*—These include a great variety of snakes, all poisonous and characterized by the expansion of the neck forming the so-called "hood."

(*a*) *King cobra (Naia hannah).*—The largest poisonous snake in the world, 10 to 18 feet long, but rather slender, with the typical expanding neck of the group. Its color is olive or yellowish-brown with ring-like cross bands of black. The king cobra is very common on Lubang Island and probably occurs on other islands of the Philippine group.

(*b*) *Indian cobra (Naia samarensis).*—The Indian cobra varies greatly in length, thickness and color but is usually col-

ored dark brown or black with no hood markings. This is the commonest poisonous snake in the Philippines.

(2) *Coral snakes* (*Elaps*).—These are the dangerous tropical varieties of coral snakes. They are usually brightly banded in red, yellow, and black. Some attain a length of 4 feet (usually are not over 3 feet) and while they rarely strike, they bite when stepped on. The fangs are short and unless the hold is firm the poison injected may not be fatal except in the larger species. At least eight species occur in Mexico and Central America, and a few more in Brazil and northern Argentina. There is so much variation in the color, width, and placement of the bright bands that no definite rule in identifying these snakes can be followed. Although there are a number of harmless snakes that very closely resemble coral snakes it is best to be wary of all red, yellow, and black snakes.

(3) *Sea snakes* (*Hydrophidae*).—This group of snakes is dangerously poisonous. They are found only in water, usually ocean salt water. One species lives in fresh water streams in the Philippines. They are usually brightly colored; some are brilliantly ringed. The head is smaller than the diameter of the body; the tail is flattened to form a paddle which assists in swimming. All but one species inhabit the China Sea, Indian, and Malayan areas. The yellow-bellied sea snake (*Pelamydrus platurus*) has an eel-like form, colored brown on top and yellow underneath, and is seldom over a yard long. It is often seen in the Bay of Panama, off Costa Rica, and the Pacific end of the Panama Canal.

(4) *Tropical moccasin* (*Agkistrodon bibneatus*).—This snake resembles the moccasins of the United States but is a far more dangerous reptile. It is generally smaller than United States specimens, but its poison is more toxic. Its disposition is savage and it strikes with marked agility. It inhabits the area extending from southern Mexico to British Honduras.

*b. Viperine.*—This family contains most of the poisonous snakes of North, South, and Central America and may be identified by the deep pit between the nostril and the eye on each side of the head. There are two main divisions of this group, those with rattles at the tip of the tail, and those without rattles.

(1) *With rattles.—Tropical rattlesnake* (*Crotalus terrificum*) is called Cascabel in Mexico and Cascavel in Brazil. It is the most poisonous of rattlesnakes and the boldest. The venom is different from that of other vipers and has a toxic action on the nerves. It occurs from southern Mexico to Argentina. The rattle is not always used in an attack, and some mountain varieties rattle and strike almost at the same time. Snakes of this group are often 6 or 7 feet long and have thick, heavy bodies.

(2) *Without rattles.*—This is a large group and includes the large number of species in the viper and fer-de-lance group (*Bothrops*) and the bushmaster (*Lachesis*).

(*a*) *Palm vipers* (*Bothrops schlegelii*), also called the horned palm viper and eyelash viper because of the scales on the head which are directed upward to form horns, contain two color phases: one, greenish, speckled with black and red; the other, equally common, yellow, dotted with black. The snakes are small but their large heads and long fangs make them dangerous. These snakes frequent trees and bushes, crawling up to 6 or 7 feet from the ground. They range from Guatemala, through Central America to northern Brazil.

(*b*) There are other similar *Bothrops:* Mexican palm viper; green palm viper and yellow-spotted palm viper, both in Guatemala; yellow-lined palm viper in Costa Rica; black-spotted palm viper in Panama and Costa Rica. There is one species limited to South America which is found in Brazil, Bolivia, Peru, and Ecuador. It is called "Surucucu patiabo" by the natives.

(*c*) *Hog-nosed vipers* (*Bothrops nasutus* and *Bothrops lansbergii*) are known locally as "Pataca" and "Lamaga." The characteristic distinguishing feature of these snakes is the turned up, pig-like snout. *Bothrops nasutus* is found on the Atlantic slopes of Central and South America. The head is dark brown; the snout has three protuberances. There is a black line running to the rear from behind each eye. The general body color is brown with small, black, quadrangular markings alternating with black spots. This snake grows to about 2 feet in length. *Bothrops lansbergii* is native to the Pacific slopes of Central and South America. It is common in the rain forests and forests of the coasts. The head is dark brown in color and lance-shaped; the snout

is turned up slightly. The general body color is brown above, with the flanks spotted with black spots or blotches.

(*d*) *The jumping viper* (*Bothrops nummifera*), also called "Manode piedra" or "Timba", is a short, heavy snake with coloring similar to that of the bushmaster (see (*f*) below). It is usually found in dry, sandy, or rocky areas. Its short muscular body enables the snake to strike hard and apparently to jump. It grows to a length of 3 feet. The body is thick, reddish-tan or red-brown in color, with black "saddles". The tail is short and pointed at the end; there is no horny spine.

(*e*) The *fer-de-lance* (*Bothrops atrox*) is one of the thirty-six species of lance-head snakes that abound in Central America and northern South America. It is known as "Barba Amarilla," meaning yellow-beard, because of its yellowish chin and throat. The body is slender, and about 3 or 4 feet in length, but may grow up to 8 feet. Its color is variable from grey to brown or reddish, with dark, light-edged cross bands or triangles. This is a very poisonous snake. Even the young only 12 inches long have enough venom to kill a man.

(*f*) The *bushmaster* (*Lachesis muta*) stands in a genus alone and is the world's largest viper. The bushmaster is more nearly like the rattlesnakes than the lance-head snakes. In Central America it is known as "La Cascabela Muda" (the mute rattler), in Brazil as "Surucucū". Nowhere over its range is it abundant but is frequently found in Costa Rica and Panama. This snake is relatively slender, usually about 8 or 9 feet long, but sometimes grows to a length of 12 feet. The body is pale brown, often pinkish, with a series of large and bold dark brown or black blotches extending along the body. The bushmaster is a bold and particularly dangerous snake and is inclined to attack without much warning.

(*g*) *Green tree vipers* (*Trimeresurus gramineus*) and (*Trimeresurus halieus*), called "Manda-dalag" or "mudfish," are vipers found in the Philippines. The green tree viper is a leaf-green snake with pale yellow stripes on each side. The tip of the tail is red, and is used for holding to tree branches. This species lives strictly in trees. The "mudfish" frequents water courses and lives largely on fish. Neither of these species is as poisonous as cobras.

*c. Boas.*—(1) Although the boas are not poisonous snakes, they are discussed in this section because they occur in

tropical areas, and some species are vicious and have great power to crush their victims.

(2) The term "boa constrictor" is the common designation given to the constrictor, a docile reptile that may easily be trained as a pet and is the species used by snake charmers. The true boas (*Epicrates* and *Boa*) are vicious and may attack man. The fangs of the tree boas (*Boa*) are well developed and can be used with telling effect. The largest of the boas is the anaconda or water boa (*Eunectes murinus*) which may attain a length of 25 feet. It is vicious and dangerous and will not hesitate to bite if disturbed.

■ 3. NONDANGEROUS AREAS.—No dangerous reptiles occur in Cuba, Jamaica, Haiti, Puerto Rico, or Hawaii.

## APPENDIX V

## VENOMOUS JUNGLE INSECTS

■ 1. GENERAL.—Spiders, scorpions, and centipedes secrete a venom which they use to kill insects and other small animal life and as a defense against their enemies. They will attack man, but in only a few species is the venom sufficiently toxic to produce a systemic reaction in adults.

■ 2. SPIDERS (ARANEAE).—Certain species of the genus *Latrodectus* and of the genus *Glyptocranium* secrete a poison (toxin) which may cause severe local and systemic reactions, including hemolysis of the red blood cells, numbness of the area bitten, fever, and a feeling of weakness, together with local swelling and inflammation.

*a. Description.*—(1) *Black widow* (*Latrodectus mactans*).—This spider lives in tropical and subtropical America. It has a velvety, black body from ¼ to ⅜ inch long and a globular abdomen with one or more red or orange spots on the upper surface. The female has an hourglass-shaped red or orange mark on the under surface of the abdomen.

(2) *Latrodectus curaçaviensis and Latrodectus geometricus.*—These occur in South America. They have dark bodies with white, gray, or yellow spots on the upper surface of the abdomen. These spiders are found under stones, in loose masonry, about barns, outhouses, and latrines.

(3) *Glypocranium gastera.*—This is a pale gray spider which lives in vines, has a globular abdomen with two prominent knobs, and is found in Peru.

(4) *Tarantulas.*—The so-called "tarantulas" are members of the Mygale family. These are large, hairy spiders, often having a spread of 6 to 8 inches. In spite of their ferocious appearance, they do not secrete a potent toxin; the bite causes local symptoms only.

*b. Treatment.*—There is no antiserum for spider bite. Treatment is symptomatic and supportive.

■ 3. SCORPIONS (SCORPIONES).—*a. General.*—Scorpions are common in the tropics, living under leaves, logs, stones, etc., during the dry season, but invading human habitations in the rainy season, where they are frequently found hiding in clothing, boots, shoes, and articles of equipment. The sting-

ing apparatus is attached to the last segment of the abdomen, the poison glands opening at the apex of this spine. The sting of the scorpion is painful, but only certain species secrete toxin of sufficient potency to produce general symptoms. The sting of the Mexican species, *Buthus martensi,* locally called "durango", has been reported to have resulted fatally in young children. Vomiting, convulsions, fever, profuse sweating, and muscular cramps may be produced in adults.

*b. Treatment.*—The venom of the scorpion may be neutralized by ammonia. Bathe the affected part with ammonia water or a solution of magnesium sulphate.

■ 4. CENTIPEDES (CHILOPODA).—*a. General.*—Only one genus of centipedes is poisonous, the *Scolopendra.* These are large, dark brown, many segmented arthropods which may reach 6 inches in length. The poison apparatus is located at the base of the first pair of legs. Centipedes live under fallen logs, stones, leaves, etc., but frequently invade habitations. The bite of the tropical species, *Scolopendra morsitans,* may cause local and general symptoms.

*b. Treatment.*—Bathe the affected part in strong ammonia water.

NOTE.—The hairy milliped (thousand-legged bug) is nonpoisonous.

■ 5. ANTS (FORMICIDAE).—*a. General.*—Ants are so well known that a description of these insects is unnecessary. There are a few kinds that bite, a few that sting, and a few that both bite and sting. The biting ants are carniverous (flesh eating), and the larger varieties have been known to attack men weakened by disease or wounded. They rapidly overwhelm the victim by the great numbers which attack simultaneously. The stinging ants inflict painful injuries by the injection of formic acid. The sting of some species is so painful that natives roll in agony on the ground.

*b. Treatment.*—If bitten, treat wound with iodine. To alleviate stings apply strong ammonia water.

■ 6. CHIGGER (TUNA PENETRANS) (TRUE SAND FLEA).—*a. General.*—The chigger inhabits Central America, Northern South America, and the West Indies. The males and females live in sandy soil and feed on the blood of animals and men. The pregnant female usually burrows into the skin about

the toes but may attack the hands, soles of the feet, or other portions of the body. As the eggs develop, the body of the insect swells, and a swelling about the size of a pea develops in the infested part. Intense itching is caused, and the resultant scratching may lead to infection and ulceration. The ulcers heal with difficulty.

*b. Treatment.*—Remove the entire insect by using a sharp needle. Sterilize the cavity by swabbing out with phenol. Neutralize the phenol with alcohol.

*c. Prophylaxis.*—Do not go about in bare feet or lie about on sandy soil in flea infested districts.

■ 7. LEECHES.—*a. General.*—Land leeches occur in the jungles of South America. They are about 1 inch long, have slender bodies, and live in rain forests and rank jungle vegetation. They attach themselves readily and can penetrate a single thickness of cotton cloth. Their bites are painless but ulceration frequently follows.

*b. Treatment.*—Apply heat to the body of the leech and remove it. Apply iodine and a tight bandage to the wound.

■ 8. FLIES.—*a. Screw-worm fly (Cochliomyia macellaria).*—(1) *General.*—This is a common fly in the Western Hemisphere, ranging from Canada to Patagonia. It is most active in the Tropics, flying during the heat of the day. It frequently lays its eggs in the nose and mouth of those sleeping in the open air, especially those who have offensive nose or mouth discharges, or ulcerations about the nose and mouth. It will also lay its eggs in open wounds. The eggs hatch in the tissues of the host. The larvae, known as screwworms, burrow into and eat the tissues of the host. They eat muscle, cartilage, and even bone.

(2) *Treatment.*—Remove the screwworms by washing out the nose, mouth, or wounds with antiseptic solution containing 1 percent procain or novocain, which paralyzes the worms and usually permits removal. Surgical measures may be required for removal.

(3) *Prevention.*—Avoid sleeping in the open. Use mosquito net or bar.

*b. Warble worms (Macaw worms, Ver Macaque) (Dermatobia hominis).*—(1) *General.*—These are native to Central and South America. The larvae infest the tissues of man. The adult fly catches a female mosquito or a biting fly and

attaches its eggs in the stomach of the captive. The incubation period of the eggs is 3 to 5 days. If, after this period, the mosquito or biting fly bites an animal or man, the heat of the body stimulates the larvae and they emerge from the eggs and enter the bite wound. They burrow into the tissues just beneath the skin and cause great pain by their movements.

(2) *Treatment.*—Widen the opening through which the larvae gained entrance to tissues, and squeeze them out.

(3) *Prevention.*—Fly and mosquito repellent salves or lotions reduce the chances of infection.

*c. Intestinal myiasis.*—(1) *Infestation.*—Infestation of the gastro-intestinal tract with larvae is common in the Tropics. The eggs of various species of flies are eaten with food upon which they have been deposited. The larvae hatch out in the intestines. They may cause diarrhea and cause alarm when noticed in the stools.

(2) *Treatment.*—A dose of castor oil will result in the expulsion of the fly larvae from the intestines.

(3) *Prophylaxis.*—Avoid contamination of food by screening from flies.

■ 9. HOOKWORM.—*a. Infection of skin.*—Creeping eruption of the skin is caused by the infective stage of larvae of the dog and cat hookworm, *Anoylostoma braziliense.* This worm infests wild and domesticated members of the cat and dog families, and passes the larval stage in loam or sand. The larvae invade the skin and move about just beneath the surface, causing severe irritation.

*b. Treatment.*—Apply ethyl chloride to skin, lightly freezing surface. This kills the larvae.

*c. Prevention.*—Do not walk about barefooted in loam or sandy soil in shady, sandy areas.

## APPENDIX VI

## WILD JUNGLE ANIMALS

■ 1. WILD ANIMALS.—The danger of attack by carniverous mammals in tropical America is limited. There are no dangerous members of the dog family. Wild hogs, crocodiles, caimans, and boa constrictors may attack man, and if able to knock him down, may cause severe injury or even death.

■ 2. WILD HOGS.—Wild hogs are fearless and when in droves do not hesitate to attack man. The boars have needle sharp teeth which can inflict dangerous wounds. If a man is knocked down by the rush of these animals, they may gore or trample him to death. If unarmed men are attacked by a drove of wild hogs, it is best that they take to the trees.

■ 3. CROCODILES AND CAIMANS.—*a.* The crocodile (*Crocodylus acutus*) is abundant along the coastal regions of Mexico, Central America, Colombia, Ecuador, and Venezuela. It may grow as long as 12 to 14 feet and can deliver a powerful blow with its tail, as well as tear the flesh with its powerful tooth-studded jaws. It will usually avoid man but when aroused is active, vicious, and dangerous.

*b. Caimans* (*Caiman*) are native to Central America and tropical South America. The spectacled caiman (*Caiman sclerops*), the common "alligator" of Central and South America, grows to 8 feet and is active and vicious, although it will avoid man unless attacked. The black caiman (*Caiman nigger*) is most common along the upper Amazon where specimens 20 feet long have been reported. It is vicious and will attack man.

*c.* Crocodiles and caimans may easily be avoided and will usually enter or drop beneath the water at the approach of man. They should be left alone.

■ 4. LIZARDS.—There are no poisonous lizards in tropical America.

■ 5. MONKEYS.—The monkeys in tropical America are tree-dwelling and, aside from stealing growing crops and sometimes food or bright colorful articles in a camp or bivouac, are harmless. Simple traps, such as a green coconut with a small hole large enough for a monkey to squeeze its hand

and arm in, but too small to permit withdrawal of the closed fist, will enable one to catch a culprit and scare away others. Even small monkeys have sharp teeth and do not hesitate to bite. Wear stout leather gloves if a live, wild monkey is to be handled.

## APPENDIX VII

## MEDICAL SUPPLIES AND EQUIPMENT

■ 1. FIRST-AID KITS.—Company, battery, and troop first-aid men should always accompany their units during exercises, maneuvers, or campaigns in the jungle. If the military situation permits and Medical Department personnel are available, a Medical Department first-aid man should be assigned to each platoon operating as a separate unit. When companies, or detachments of similar size, operate at a distance from the battalion aid station, regimental aid station, or camp dispensary, additional Medical Department personnel should be attached, if the military situation and available personnel permit.

■ 2. MEDICAL SUPPLIES AND EQUIPMENT NEEDED.—*a. By each individual.*

| | |
|---|---|
| Foot powder | ¼ lb. |
| Bandages, gauze roller, 2-inch | 1 roll |
| Plaster, adhesive, 1-inch | 1 spool |
| Ointment, 2 ounces | 1 box |
| Cream, antimosquito (Dover's) | 2 oz. |
| Sodium chloride (salt), 5-grain tablets, 60 | 1 bottle |

*b. For 12 men.*

| | |
|---|---|
| Acid, acetylsalicylic, USP, 5-grain tablets | 100 tabs. |
| Magnesium sulphate, USP | 1 lb. |
| Quinine sulfate, USP, 5-grain tablets | 200 tabs. |
| Bandage, gauze roller, 2-inch | 6 rolls |
| Plaster, adhesive, 3-inch | 1 spool |
| Kit, suction (for snake bite) | 1 each |
| Castellanis' paint, 6 ounces | 1 bottle |
| Tincture Iodine, 2 ounces | 1 bottle |
| or | |
| Tincture Iodine | 24 ampules |
| Folding litter | 1 each |
| Rubber wash basin | 1 each |

## APPENDIX VIII

## STAFF DATA FOR JUNGLE WARFARE

| | Number of men (1 squad) | Distance (yards) | Width (yards) | Area (square yards) | Hours | Tools |
|---|---|---|---|---|---|---|
| Trail breaking | 12 | 3,000 | 2/3 | 2,000 | 3-6 | Machetes. |
| Trail clearing | 12 | 1,000 | 1 | 1,000 | 12 | Machetes, axes. |
| Bridge building (animal) | 12 | 6 | 3 | 18 | 4 | Do. |
| Corduroying, cutting and placing. | 12 | 100 | 3 | 300 | 12 | Do. |
| Area clearing | 12 | 1,000 | 1 | 1,000 | 12 | Do. |
| Trail blocking | 12 | Time for felling trees | | | ------- | Do.e |
| Road building, dirt, passable for 1 vehicle. | 12 | 50 | 3 | 150 | 12 | M achets, axes, shovels, picks. |
| Fire lane cutting | 12 | 1,000 | 2 | 2,000 | 18 | Machetes, axes. |
| Tree felling (cutting) | 2 | Can fell a single tree from 10 to 20 inches in diameter in 15 to 45 minutes. | | | | Axes. |

# INDEX