

WATER PLANTS

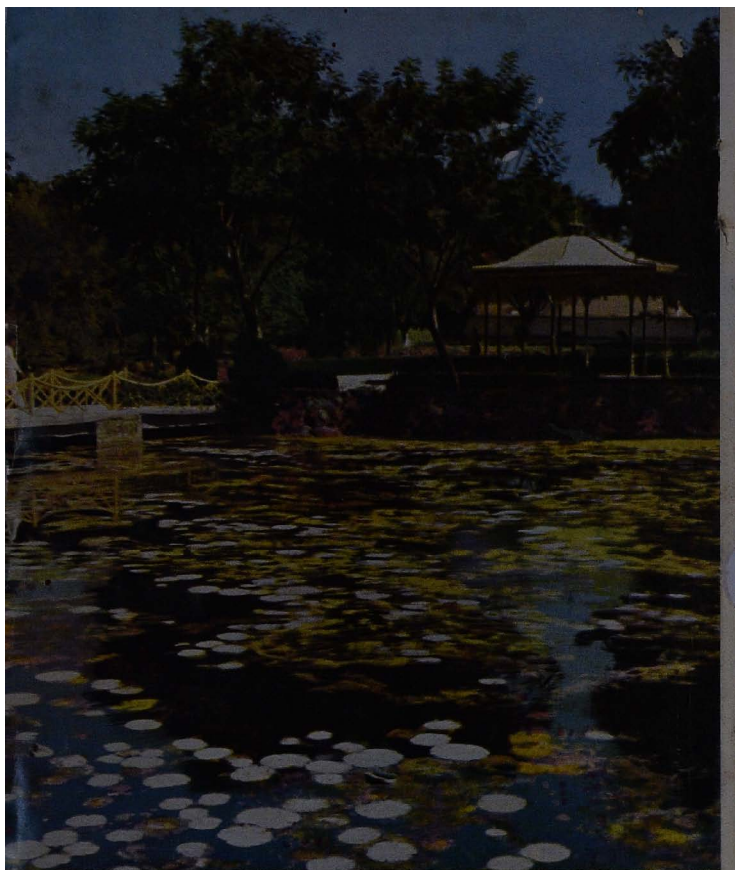
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WATER PLANTS



Lotus pond in a garden

WATER PLANTS

BY

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Preface

ORNAMENTAL gardening, at one time the hobby of only kings, emperors and the well-to-do sections of society, has now begun to receive attention at the hands of the Central and State Governments, corporations, municipalities and the general public. There is, however, one aspect, water gardening, which still remains neglected. In fact, our forefathers took great interest in the cultivation of water plants, and the lotus and water-lilies occupy a unique position in Indian mythology.

It is the general apathy towards the beautiful and economic plants that grow in water which has prompted me to write this small bulletin. I have made an effort to provide information,

though briefly, on different types of water plants which can be successfully grown in our country. These plants can not only be grown in parks and gardens in the cities, but also in the numerous village ponds and even small lakes which at present look ugly with stagnant water. Combined with pisciculture, water gardening has the potentiality of reducing the incidence of malaria without much of human effort.

The first two chapters describe the importance of water gardening and layout and construction of water pools. Then follow chapters on the description and cultivation of water and bog plants. Chapters 8 and 9 deal with floating and oxygenating plants. Practical hints on the planting of aquatic plants are given in detail in Chapter 10. Fish in pools has been dealt with in Chapter 11.

I have great pleasure in acknowledging with thanks the valuable assistance rendered by Shri Bhanu L. Desai, the joint author of this book, who took great pains in going through the manuscript and suggesting improvements. But for his help, this booklet could not have been presented in its present form.

I am also highly thankful to Dr. M.S. Randhawa, an ardent lover of gardening, who showed keen interest in the bringing out of this publication. But for his encouragement, this material, collected during my long years of water gardening, would never have seen the light of the day.

BAJRANG BAHADUR SINGH BHADRI

RAJ NIWAS

SIMLA

July 9, 1962

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Introduction

THE British brought to India their turfs and flowers, and many of these have found a permanent place in our gardens. But they completely ignored the lotus, so sacred to the Indian thought, and its sister plant, the water-lily. In New Delhi, the capital city of this ancient country, there is hardly any planned planting of water-lilies. Only here and there a tuft or two of bog plants and a few water-lilies that may never flower are met with.

The Muslim invaders of India knew more about water gardening but not enough about water-lilies. They did not, therefore, give any place to water plants in their monumental gardens in various parts of the country. And since the British

who succeeded them were also indifferent, although on the European Continent water-lilies always had an important place in the garden, this ancient art of water gardening virtually disappeared from the country.

In Indian mythology, the lotus occupies a position that cannot possibly be surpassed by any other flower. It is a symbol of cosmic creativeness. While the stem is identified with the navel cord of Lord Vishnu, the flower is referred to as the throne of Brahma, the Creator. A more primal place could not be assigned to any other creation!

Temple gardens were a conspicuous feature of the Buddhist period, and lotus pools were a *must* in these gardens. With the spread of Buddhism to China and Japan, water gardening spread to these countries and came to be developed to a high degree of perfection. It is unfortunate, however, that in India lily pools have lost their importance. Only in the south are there still to be found tanks in the precincts of certain temples where a few water plants flourish. These are mostly pink or white water-lilies. They languish neglected, and nobody ever thinks of adding to them the more colourful varieties.

The neglect of water gardening in our present-day ornamental gardening appears all the more surprising when one reflects how without much effort or expense it can provide exquisite beauty and fragrance throughout the year in the plains and at least in summer at higher altitudes. Daily watering and frequent hoeing and weeding, so necessary for any other type of garden, are not required at all. The maintenance cost is only a fraction of the recurring costs in other forms of gardening. Yet the bloom of flowers and the freshness and fragrance which they exhale, combined with the coolness that a pool provides in the hot summer months when the landscape around looks parched and barren, are an ineffable experience. In winter, the water garden is a picture of quiet repose, softening the severity of the season with its eternal promise of spring. Many varieties of water-lilies are continually in bloom, whatever the season, and, once planted they flourish for years.

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Construction of Pools

THE pools in water gardening may either be made of cement concrete or bricks plastered with cement, or simply dug in the ground if the soil is suitable and will hold water. However, their construction requires considerable forethought and planning.

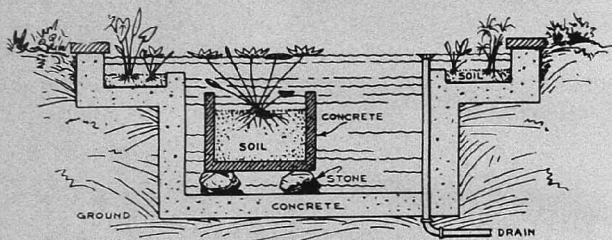
The shape and size of the pool will depend on the availability of space and on individual preferences. In the selection of site, it should be ensured that the pool receives ample sunlight during the greater part of the day, for without it it will not be possible to get the best results.

Generally speaking, the side walls of a pool should be about six inches thick with a slow gradient that would give a

thickness of about eight inches near the bottom. The bottom need not be thicker than six inches, provided the base has been well-soled with rubble to ensure a firm foundation.

For preparing the concrete, the proportions of cement, sand and aggregate should be 1 : 2 : 2. The aggregate may consist of clean gravel, crushed stones or broken concrete. The constituents should be mixed thoroughly, adding water to get a mixture of proper consistency. The whole mass should be turned at least twice.

In the hilly areas, flat stones may be substituted for bricks as these are more readily available. Alternatively, rock pieces of different sizes may be placed around the sides, made



A concrete pool with a clean bottom, showing a concrete tub placed on stones under water, shelves on the sides for bog plants and an overflow pipe

firm previously, in whatever manner one may like to arrange them. Cement mortar should be used to hold them together.

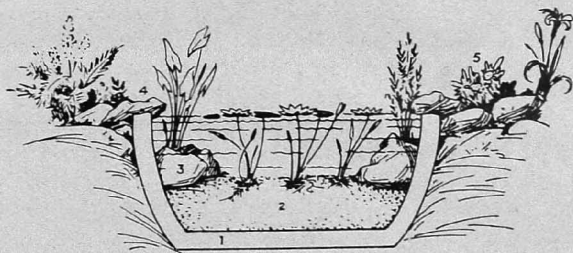
After construction, either water should be sprinkled frequently over the plaster, or the bottom as well as the walls may be covered with wet gunny bags or straw. The pool should be filled only when this can be done without damaging the plaster. Otherwise, small cracks might develop, making the pool leaky. It is better to fill and empty the pool several times during the first two weeks before any planting is done, so that all traces of alkali may be washed out.

Drains and overflows may be located at any convenient point. It is necessary that the bottom of the pool should slope

towards the outlets. If it is possible to connect the drain channel to a sewer, this should be done. But where there is no sewer nearby, drainage may be provided by digging a good-sized hole, three to four feet deep, and filling it with pieces of rock or brickbats up to about a foot from the surface. The water from the pool may either be drained into this improvised basin or used for irrigating the other parts of the garden.

Actually, no elaborate drainage system is necessary for a lily pool. If it is properly constructed, it may not have to be drained at all; at the most, it may have to be emptied only once a year. Even at higher altitudes, if the pool is well-constructed and is provided with a wooden cover over which leaves can be heaped during winter, the water, the plants and the fish would remain in proper condition all the year round.

An ideal lily pool is two feet deep. If the water is deeper than this, planting-boxes will have to be elevated on stones as many varieties do not flourish if more than eight inches under water. In the plains, no doubt, many species of water-lilies can thrive and flower even in six to eight feet deep water. But



A masonry pool (1). The bottom is filled with earth and manure (2), with a few stones (3) to hold tall plants and a few irregular stones (4) placed on the edges to cover the wall of the pool. Marsh-loving plants on the sides (5) lend a naturalistic touch to the whole arrangement

such great depths are not normally considered suitable, as in winter the plants are more likely to go dormant in deep waters than in shallow ponds.

Some of the aquatics need to have their roots in the mud in very shallow water, hence they are called bog plants. As these plants look very attractive along the edge of the pool, proper provision should be made for them at the time of

the construction of the pool. This can be easily done by making a ledge on the sides, either all round the pool or in the end walls. Such plants can also be cultivated on raised steps.

A lily pool does not need a fountain in it, nor fresh running water. In fact, lilies do best where the water is warm and remains at an even temperature. However, fountains and other decorative waterworks do not affect cultivation and may be had if desired.

Even in rural areas, many of the existing village ponds, which look so unsightly with their stagnant water breeding mosquitoes, can easily be transformed into beauty spots by introducing a few water-lilies into them. These would deck the village with their colourful blooms. Besides, they would provide the necessary shelter for fish to thrive and these fish would eat up all mosquito larvae.

A pool for water gardening should be stocked with the proper type of plants, fish and other aquatics. The plants are generally water-lilies and lotuses, bog plants and the so-called 'oxygenating' plants; the fish may be of ornamental or table variety. Snails and frogs, which are usually kept in pools in temperate zones, are to be avoided in tropical climates, for they ultimately become pests, very difficult to eliminate.

The space requirements of the plants should be adequately provided for while laying out the pools. A water-lily should generally have about nine square feet area in small pools and 16 to 24 square feet in larger ones. If lotuses are also to be included, additional space would be needed.



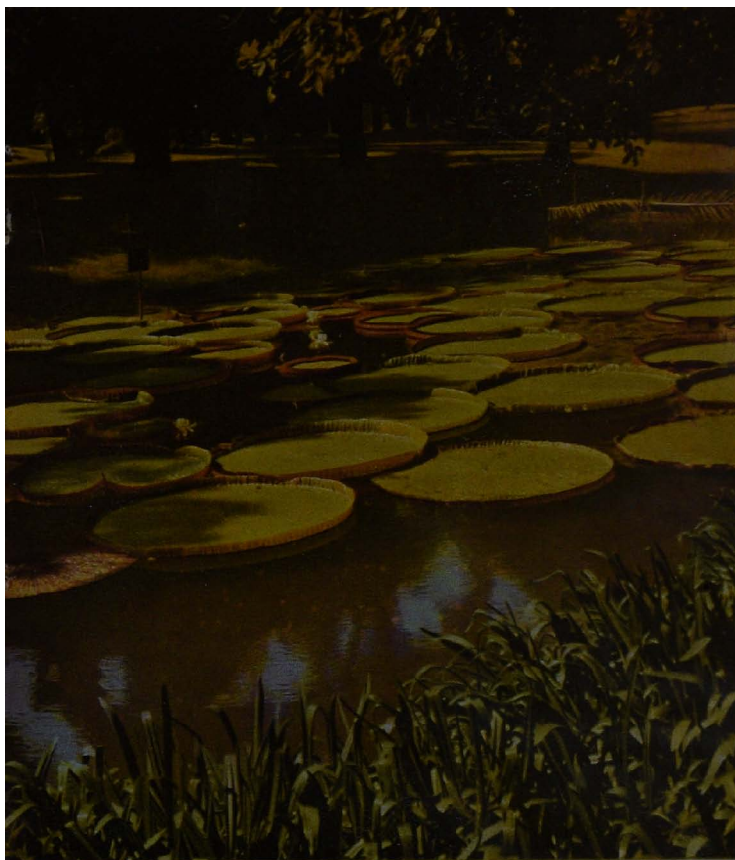
Victoria

VICTORIA, belonging to the family Nymphaeaceae, is an aquatic herb resembling a large water-lily mostly found in a natural state in the tropical forests of America and Africa. In India, it is rarely seen in some of the large botanic gardens. This aquatic has been named after Queen Victoria. It is a prickly plant having very thick rhizomes with very large, round leaves about four to six feet in diameter. The stout veins on the undersurface of the leaves reinforce the upper surface in such an ingenious way that a child can easily stand on the leaf without drowning. The flowers are white and more than 12 inches across. The leaves float on the water, but the flower-stalks rise above its surface. For a full growth, *Victoria* species

need an open location enjoying a good deal of sunshine.

Two species of *Victoria* are worth noting: *V. regia* (also known as *V. amazonica*) and *Victoria cruziana trickeri*. *V. regia* has the characteristic thick rhizomes and large leaves, four to six feet across and slightly oval in shape. The turned-up leaf-edge is two to four inches high. The lower surface is deep green or red-brown, attached to a very heavy, prickly, ill-shaped stalk. The very large white flower, which is more than one foot in diameter, has inner filaments which turn deep pink or purple. *V. cruziana trickeri* has leaves three to four feet in diameter, with the usual raised leaf-edge. The flowers, which are white at the blooming time, later on turn red. They measure 14 to 18 inches in diameter.

As the *Victoria* species are very heavy feeders, possessing an extensive capacity for growth, they are best grown in very rich loamy soil, in an open location, in a very large tank with a minimum of 400 square feet area.



Leaves of Victoria regia



Leaf, flower and fruit of Nelumbo

4



Nelumbo

NELUMBO (*Nelumbium*), a member of Nymphaeaceae, is a genus of vigorous aquatic plants growing luxuriantly in very large sheets of stationary or slow-moving water. The well-known *Nelumbo* species are found growing wild in Asia, Australia and North America. All of them can be grown with ease in our garden pools of large dimensions, or even small ponds.

Nelumbo has thick tubers which spread under deep water on the floor of the pond or pool. The bluish-green leaves are covered with a wax-like substance. They are round in shape, attached to long cylindrical stalks, and normally rise well above the surface of water.

The large flowers, more than 12 inches across, possess

a charm of their own. They too bloom high above water, even higher than the leaves. The sepals are four to five, while the petals are many. The stamens, many in number, are attached in the flower in a characteristic way.

The fruit, which appears like an inverted cone or the rose of a watering-can, contains many rounded seeds imbedded in its flesh. The tubers and seeds are edible. In fact, this plant suffers badly at the hands of the local people in search of food.

Nelumbo nucifera (*Nelumbium speciosum*) is the species which is prominently found in India, China, Japan and other countries in the tropics. This is the well-known Lotus of the East so much praised, worshipped and mentioned in our ancient literature. Many consider *N. nucifera* as the Egyptian Lotus, but authorities state that it is not a native of the Nile.

The leaves of *N. nucifera* rise two to six feet above water. They are large, blue-green and rounded with a wavy edge, and are borne on thick, rough stalks. The flowers are pinkish white. In some varieties, the flowers are pink, rose, rose-white, pure white and amaranth-red. Many hybrids, differing in colour and form, have been developed from this species. The flowers of *N. nucifera*, almost 12 inches across, give out slight fragrance.

N. lutea is the American Lotus with pale yellow flowers eight to ten inches in diameter. The leaves are green and 15 to 22 inches across. The tubers of *N. lutea* are edible. These are extensively used by the Red Indians as food. Its flowers are also slightly fragrant.

For cultivating *Nelumbo* in the garden, a special tank has to be constructed. The bed of this pool or tank should be filled with a good, light soil made rich in plant food by the addition of decayed farmyard manure. A 12-inch layer of soil is enough to grow this plant. The rhizomes or tubers are planted in this layer. The leaves and buds rise out of the water in due course. The depth of the water above the soil may vary from 12 inches to many feet, depending upon the individual convenience and taste.

Nymphaea



NYMPHAEA (syn., Castalia) belongs to the family Nymphaeaceae. It is commonly called the water-lily. Its flowers are white, yellow, blue and red. The flowers vary in size from one inch to 14 inches across. They remain a few inches above the water surface, while the leaves normally touch the water surface or spread flat over it. They differ in this respect from Nelumbo whose leaves and flowers remain quite high above the water surface.

The flowers of the various *Nymphaea* species differ in their morphological details which are not readily detected by a casual observer unless the flowers are placed side by side for a comparison. But the transverse sections of certain floral as well

as other parts of different *Nymphaea* plants indicate distinct structural differences under the microscope, thus enabling the classification of its innumerable species into groups.

The blooming habits of the flowers are not uniform ; some bloom in the evening, others in the morning. The hour at which these flowers bloom and their duration change according to the special characteristics of a particular species. Hence, it is not unusual to see at one time water-lily flowers in various stages of development and opening in a pool stocked with different species of *Nymphaea*.

Due to the natural crossing between the species of *Nymphaea*, innumerable hybrids have developed and still continue to grow in number, with the result that it has become difficult to name them correctly and systematically for purposes of proper identification. Besides, artificially hybridized varieties have been swelling the old list of water-lilies.

The two divisions which can be differentiated by the attachment of their carpels, i.e., the fruit or seed-bearing parts, are Apocarpiae—with carpels not joined at their sides, and Syncarpiae—with fused carpels. These two divisions have been further subdivided into five subgenera :

1. *Anecphyra*, with blue, white or rosy flowers ;
2. *Brachyceras*, with blue, white, pink or yellow flowers ;
3. *Castalia*, mostly consisting of water-lilies which bloom during the day, with the colour range of white, yellow, pink and red ;
4. *Lotus*, with delicate red and white flowers mostly opening at night ; and
5. *Hydrocallis*, with white, night-blooming flowers.

The following list representing the *Nymphaea* species known to the gardening public, is by no means exhaustive.

White-flowered *Nymphaeas*

N. alba. The popular water-lily (*Castalia alba*) is a hardy species having round, heart-shaped leaves measuring two to 12 inches across. The leaves are deep purple or red when young. The rootstock or rhizome is black. The white flowers of this species have broad, oblong petals, and float on the water surface. The flowers open with the sunrise and close in the afternoon. The varieties of *N. alba* are many, the important

among them being *candidissima* with roundish leaves, overlapping petals and light yellow colour at blooming time. Others—*delicata*, *splendens*, Albatross and Hermine, are also grown in many gardens.

N. ampla. A white-flowered water-lily with shield-shaped leaves and a slightly undulating margin, found in Texas and South American countries. The varieties *speciosa* and *pulchella* have small flowers, while the variety *Gerardiana* produces very large flowers above the surface of water.

N. odorata (*C. odorata*). This water-lily is one of the sweet-scented species of *Nymphaea*. The leaves are round, deep-green on the upper surface and slightly red underneath; sometimes, both the surfaces are near-green, measuring about five to ten inches across. The white flowers tinged red belong to two of its garden varieties.

N. lactea and *N. superba* have flowers three to six inches in diameter. They open early in the morning and close about noon. The variety *gigantea*, a delicate type, has white flowers without the red tinge. It is popularly known as the rice-field water-lily. The leaves and flowers of this variety are larger as compared to the other varieties of the *odorata* species.

N. lotus, or the White Lotus (*C. lotus*), has flowers almost ten inches across with very large, slightly hairy, rounded leaves.

N. marliacea. M. Latour Marliac of France has raised innumerable hybrids from *N. alba* and *N. alba* var. *rubra* × *N. tetragona* in the past century, and these are known as Marliac hybrids. *N. marliacea albida* is a variety known for its near-white flowers with a rosy tinge. Similarly, *N. gladstoniana* produces white blooms with a touch of rosy hue.

N. tuberosa (*C. tuberosa*), with round leaves and wavy or whole edges, has about four to nine inches across, white flowers with slight fragrance. The leaves are entirely green without any tinge of red or brown. The chief characteristic of the rhizomes of this species is that the small tubers developing on them get detached by themselves and spread all over the pool. The broad-petalled flowers open late in the morning and close at noon.

The variety *Richardsonii*, also known as *plena*, has a full flower with many petals as compared to the other varieties of this

species. *N. candida* resembles *N. alba*, but has smaller, white flowers. It is one of the hardy European species. *N. pygmaea alba* is a small-flowered white variety. *N. pubescens*, another small-flowered white variety, has leaves with a slightly hairy undersurface. It is found in a natural state in many parts of the Orient. Gonnere, a full-blooming white water-lily, Juno, a pale yellow or creamy-white-flowered type and Mrs. George H. Prires, a pure white-flowered type with pointed petals, Dawn, Purity and *virginale* are also found listed as white types.

Yellow-flowered Nymphaeas

N. mexicana, also called *C. mexicana* or *N. flava*, has oblong leaves with a cut leaf-edge. The surface is green with brown blotches, the lower surface being dark red with darker spots. *N. marliacea* var. *chromatella* is a hybrid with roundish green leaves, spotted brown and rising a few inches above the water surface when their growth is congested. This hardy variety is popular among growers due to its profuse blooming habit. *N. moorei* is a hybrid resembling the above. *N. tetragona*, also known to some as *N. pygmaea*, has leaves with two hues — green above and brown below. This tiny-leaved plant produces very small yellow blooms hardly two inches across. It is perhaps the smallest water-lily grown in any garden. *N. tetragona* var. *helvola* has oblong-shaped, small leaves spotted all over. The very small yellow-coloured flowers bloom in the afternoon.

The other two Nymphaeas hailing from S. Africa are *N. sulfurea* and *N. stuhlmannii*, having sulphur-yellow flowers. The first species has very small flowers, while the latter has flowers with a diameter of about six inches. A hybrid, *N. odorata* var. *sulphurea*, has medium-sized pale yellow flowers which bloom in the morning. The strain *grandiflora* of this hybrid is more vigorous than the parent.

N. rudgeana has lobed and oval leaves. The flowers are lightly scented and greenish yellow. It is a night-blooming water-lily. The other yellow varieties easily recognized by the water-lily cultivator are *solfatare*, Sunrise, St. Louis, Paul Hariot and Sioux.

Pink-hued Nymphaeas

N. odorata, a sweet-scented water-lily having white flowers,

has varieties which produce pink blooms. The variety *rosea* is one of them. It is also called the Cape Cod Water-lily. Its leaves are brown on both the sides in the early stages of growth, but later the upper surface turns green. The pink flowers are about four inches across. They remain open hardly for a day. The variety *exquisita* is hardier than *rosea*, but has deeper flowers.

N. laydekeri lilacea, a scented water-lily, produces rosy flowers which later turn light crimson. This water-lily is hardy and is suitable for growing in small lily ponds. *N. laydekeri purpurea* is a variety having pink flowers. This is also suitable for tub culture. *N. laydekeri rosea prolifera* has pink flowers four to six inches in diameter. The hybrid *Alba rubra* × *tetragona* is an attractive water-lily with medium-sized pink flowers. The green surface of the medium-sized leaves of this plant is speckled with brown patches.

N. luciana, also known as *N. odorata luciana*, is a rose-hued, fragrant-flowered water-lily. This variety is an improvement on the original *N. odorata caroliniana*. Other water-lilies allied to *N. luciana* are *N. suavissima*, *N. odorata delicata*, *N. tuberosa rosea* and *N. speciosa*, besides many other more modern forms to which Lustrous, an American hybrid with rosy flowers, probably belongs.

Among the other pink-flowering varieties developed by Marliac, Laplace with delicate lilac-rose flowers, *rosea* having large, cup-shaped, deep rose-pink flowers and Flesh bearing fragrant, flesh-pink blooms, are the well-established water-lilies. Masaniella—cup-shaped and pink-flowering, Madame Julien Chiffot—producing very large ten-inch flowers of a pink hue, Madame Wilfron Gonnere bearing cup-shaped, pink flowers, Morning Glory and Mrs. C. W. Thomas having shell-pink flowers, Mrs. Richmond—a globular, deep-pink-flowering lily, and Murillo (a star-shaped lily belonging to the pink class) having flowers with outer petals flushed white and inner petals bright rose, are some attractive varieties.

Other well-known varieties in the pink class are the hybrids Neptune, Pink Opal, Pink Sensation, *purpurata*, Rene Gerard (a large-flowered lily with nine-inch flowers), Rose Arey, having incurved petals, Rose Magnolia, Rosita, *somptuosa* (a French variety) and Souvenir de Ules Jacquier (a free-

flowering hybrid with large flowers globular in form and of a mauve-pink hue).

Some of the hybrids produced from *Nymphaea rubra* and *N. lotus* and from *N. rubra* and *N. L. dentata* are worth mentioning here. *N. smithiana* has delicate pink flowers, *N. delicatissima* produces light pink blooms and *N. kewensis* and *N. micheliana* have rose-pink flowers.

There are very few water-lilies bearing true red-coloured flowers. They are either pink-red or purple-red. *Nymphaea rubra* is distinguished by its brown and bronzy leaves which turn greenish. The leaves have a large surface, 2 to 18 inches in diameter. The flower which is fairly large, six to eight inches across, has a deep purple-red hue. It generally opens out at night and closes the next day before noon. *N. rubra* is one of the indigenous water-lilies. On account of the ease with which it produces fertile hybrids, it has been used for producing many horticultural forms. Besides the pink-flowered hybrids mentioned earlier, the other garden forms, such as *N. krumbiegelii*, *N. columbiana* and *N. diana grandiflora*, produce carmine flowers. The lily with dark red flowers is *N. purpurea*, while lilies known by the names of Frank Trelease, Rufus J. Lackland and James Gurney Jr produce deep purple-crimson blooms.

Other popular garden forms are Attraction, a large-flowered lily with deep red flowers having sepals with white stripes, the floriferous Charles de Meurville having wine-red flowers, and Conqueror bearing large, bright red flowers with the petals striped white. They are worth the attention of the water-lily grower. Escarboucle, Galatee, Meteor, Murillo, Picciola and Sirius are the well-known hybrids producing dark red and wine-red blooms.

Among the Marliac favourites, the hybrids Splendide with dark red blooms and Sultan with white-tinged red flowers, are prominent. Others—James Brydon, James Hudson and William Falconer, are classed among the red-flowered hybrids. Marliac has raised some very good variegated and striped red varieties of water-lilies. The chief among them are Darwin with large, fragrant flowers striped white, Esmeralda with long-petalled flowers having white and red markings, and Eucharist, Livingstone, Phoenix and Sylphida—the hybrids with red and white-striped flowers.

The flowers of some of the species change their hue after they have opened out. The hybrids from *alba*, *rubra* and *mexicana* belong to this class. *N. robinsoni*, *N. seignoureti*, *N. andreana*, *N. aurora*, *N. chrysantha* and *N. laydekeri fulva*, the better-known hybrids, have this characteristic. For instance, the cream-yellow flowers of *aurora* grow deep red with age. *Chrysantha* flowers turn deep vermilion from cream-yellow. Most of the flowers in this class have light yellow flowers which later turn pink, then orange, and when the blooms get old, deep red. The flowers of the above-mentioned hybrids, five to eight inches across, are smaller as compared to those of the recent hybrids popularized under the names of *N. indiana*, *Comanche*, *Sioux*, *N. solfatara*, *N. graziella*, *N. formosa*, *N. punicea*, and the other known forms, such as Phoebe, Phoenix, Paul Harriot and Jean Forestier.

TROPICAL WATER-LILIES

The water-lilies of tropical origin are eminently suited for growing in the plains. Their cultivation at higher altitudes is not difficult. These lilies have very lovely forms and can provide great splendour of colour in our gardens in open or indoor pools. The size of these tropical water-lilies varies from a few inches to one foot. Given appropriate cultural conditions, they can provide blooms during all the seasons.

The rhizomes of almost all the tropical species get firmly imbedded into the bottom of the pool. It is a hard tuber, unlike an irregular rhizome of the other types of water-lilies. Often, the entire plant dies out under adverse conditions of growth, but as soon as optimum conditions are available the dormant tuber sends out new roots and shoots.

The blooms of tropical lilies are mostly star-shaped, rising well above the surface of water, sometimes as high as 12 inches. The colour of many of its hybrids ranges from shades of blue to white, pink-red and purple. Some of these are day-blooming hybrids, while many open out in the evening and close in the morning.

Popular selections

Nymphaea stellata, though not a very distinguished lily, is important for having proved useful in the production of new hybrids. It is also known as the Blue Lotus of India. The broad, shield-like leaves of this species are green on the upper

surface and purplish underneath. The flowers, of a pale blue hue, are three to six inches across and remain open just for a few hours during daytime.

Sometimes, white and pink varieties of *N. stellata* are also observed. *N. caerulea*, also called the Blue Lotus of Egypt, is a day-blooming lily with light blue, pointed flowers the base of which is dull white. The leaves are narrow, shield-shaped, with the lower surface green-marked with dark irregular dots. The blooms open out for a few hours during the day. Some of these species are found with white or red flowers as well.

N. berolina is a hybrid, probably from *N. capensis* and *N. stellata*. The flowers are deep blue and large-sized, measuring eight to ten inches across, and open out successively for three to four days during the bright hours of the day.

N. daubeyana is a free-flowering hybrid with light blue flowers. The interesting thing about this water-lily is that it produces tiny tufts near the leaf-petiole, which develop into new plants and produce flowers while attached to their parent plant. If required, the young plants can be separated from the old leaves and planted out elsewhere.

N. capensis, known as the Cape Blue Water-lily, has deep sky-blue flowers about six to eight inches across. The flowers open out for a few hours by day for three to four days. The variety *N. capensis zanzibariensis* has bigger, blue, and *azurea* and *rosea* have light blue and light pink flowers, respectively.

N. pulcherrima is one of the very good day-blooming garden hybrids with its probable parentage of *N. caerulea* and *N. capensis*. It has moderately shield-shaped leaves, with a green undersurface heavily covered with deep purple irregular dots. The blue flowers are large, almost 12 inches across. The hybrid *N. pennsylvania* (or Blue Beauty) is another attractive day-blooming water-lily with very large, deep blue flowers.

The recent introductions in water-lilies with blue flowers that bloom by day are the hybrids Mrs. Edwards Whittaker—with large-sized lavender-blue flowers, the other varieties with lavender-blue flowers being Henry Shaw, Marmorata, Mrs. Woodrow Wilson and its variety *gigantea*, Col. Lindbergh having blue blooms, Blue Bird, Amethyst, Antoinette Chaize and August Koch having purple-blue flowers, Blue Triumph and *eastonensis* with steel-blue flowers, Francois Treyve having



N. chrysantha



Eichhornea crassipes, the *Water Hyacinth*

indigo-blue flowers, *Henkeliana* with scented and somewhat flat flowers, *Independence Blue* with a blue flower that changes its hue, *Judge Hitchcock* and *Madame Abel Chatenay* with lavender-blue flowers and mottled foliage, *Madame Herbert Cutbush*, *Pamela* and *William Stone*—the outstanding varieties of violet-blue colour, *Panama Pacific*—a wine-red or purple-flowered variety, and many others that form a formidable class of day-blooming blue-purple lilies.

Among the pink-flowered day-lily hybrids, *General Pershing* with a fragrant pink bloom, *Independence* with large blooms of a pink hue, *Mrs. C.W. Ward*—a free-flowering hybrid, and *Patricia* produce new plants on the leaf-petioles, and so are easy to multiply. Some more pink-flowering hybrids found in the trade list are: *Castalliflora*, *Chicago* and *Cleveland* with scented rose-pink flowers, *Edward C. Elliott*, *Gzetta Jewel* and *Pink Pearl* having bright silver-pink flowers and the large-flowered *Stella Gurney*. The class of very deep pink, or almost red-flowered, day-blooming water-lilies, though not large, consists of varieties such as *A. Siebert*, *B.C. Berry*—a ruby-crimson-flowered variety, *Capensis forma rubra* with sweet-scented flowers and the large-flowered *William Ward*.

There are not many hybrids which can be classed as purely purple-flowered, but *Director Moore*, *Jupiter*, *Royal Purple* and *Reine d' Italie* may very nearly approach purple hues in their blooms. Similarly, day-blooming true yellow water-lilies are very few. *Maynardii* and *St. Louis* may be taken as true representatives of this class. The fragrant-flowered *Mrs. George H. Pring* and *Janice* are the two white day-blooming water-lilies.

Night-blooming tropicals

The tropical night-blooming water-lilies are innumerable. However, only a few prominent hybrids are mentioned here.

Among the red group, *Adele* has magnificent crimson-coloured flowers. *Albert d'Argence* produces red flowers with orange-red stamens. *Armand Millet* is a hybrid with large flowers of a brilliant reddish-purple shade and green foliage. *Arnoldiana* is a rose-carmine-flowered variety. *Bissetii* has cup-shaped flowers of a glowing rose colour. *Boucheana* blooms are rose-pink, having broad, flat leaves. *Columbiana* is a deep dark-red-flowering variety. *Devonshire's* bright rose-red flowers

are large, measuring 8' to 12 inches across. *Diana* is a variety with rose-carmine flowers. *Diana grandiflora* also produces flowers of a carmine-red shade. Doctor Florenze is a dark-red-flowered hybrid. Frank Trelease blooms are eight to ten inches in diameter and of a glowing dark crimson colour. George Huster has velvety deep crimson flowers. H.C. Haarstick produces flowers of a brilliant red shade with copper-colour leaves. *Indica bhrama* is a variety with fiery rose-coloured flowers. *Indica hofgardirektor graebner* blooms are large and deep reddish brown in hue. James Gurney Jr is a crimson-flowering variety changing its hue with age to a deep purplish-crimson shade. Jules Vacherot is a free-flowering hybrid with flaming red blooms. *Krumbiegelii* has carmine-red flowers. Marie Lagrange produces rose-purple flowers with prominent white lines and yellow stamens. Mars has flowers of a bright rose-vermilion shade. Niobe is a variety which bears magenta-carmine flowers. O'Marana has flowers of a rose-red shade ten to 12 inches in diameter. President Girard blooms are rose-carmine. Pride of California is a free-flowering variety with blood-red blooms. *Purpurea* has dark purplish-red flowers. Rufus J. Lackland produces flowers of a crimson shade on opening out. *Sturtevantii* has big, rose-pink, cup-shaped flowers.

The night-blooming class of water-lilies has the following outstanding pink varieties. *Deaniana* has cup-shaped flowers of a clear pink shade. *Delicatissima* produces light pink flowers and foliage having a metallic lustre. *Kewensis* has pink flowers and green foliage mottled with brown patches. *Laelia* is a delicate-pink-flowering variety. *Laelia colorans* has flowers similar to those of *Laelia*, but of a deeper shade. Mrs. George C. Hitchcock has large, rose-pink flowers. *Ortgiesiana rubra* produces abundant flowers of a clear pink shade. *Indica isis* has blooms delicate pink in hue. *Indica spira* is a rose-pink-flowered variety with broad concave petals.

White-flowered water-lilies blooming at night are very few. Juno has pure white flowers ten to 12 inches in diameter. La Reine de Los Angeles is a glistening-white-flowered variety with broad petals. Minerva produces pure white, large, cup-shaped flowers. Missouri, a cream-white-flowered variety, has blooms ten to 14 inches across. Jubilee has pure white flowers six to eight inches across. *Ortgiesiana alba* produces large, open

flowers of a cream-white shade. *Smithiana* has cream-white flowers with yellow stamens. *Tanganyika* has pure white flowers.

Among the water-lilies, some species and hybrids of *Nymphaea* are popular on account of their miniature flowers. These grow abundantly in the limited space of a tub, an aquarium or a small-sized pool. Some of these have already been mentioned earlier, but to bring them out more prominently their names are repeated here along with the other varieties: Yellow Pigmy and White Pigmy, *Pygmaea alba*, *Odorata minor*, Joanne Pring with pink flowers; *gloriosa* and Golden Cup with red and yellow blooms, respectively; Pink Opal and August Koch having lilac flowers; Royal Purple and Dauben producing lavender-blue blooms; yellow-flowered *Colorata patricia* with crimson flowers, and *aurora*.

Similarly, as stated earlier, some of the *Nymphaea* species and their hybrids have a tendency to produce dormant plants on the petioles of their leaves. These may be classified as viviparous. These miniature plants are a source for easy multiplication of varieties. As this plant characteristic has some importance in the garden, the trade names of such water-lilies are given here besides those mentioned earlier: Peach Blow, a variety with pink, large, full-rounded flowers; Pink Platter having pink flowers, large, wide and flat in appearance; Rio Rita, a pink, large-flowered variety; Talisman with pink, star-shaped flowers; Wild Rose producing pink, solid flowers, and Panama Pacific.

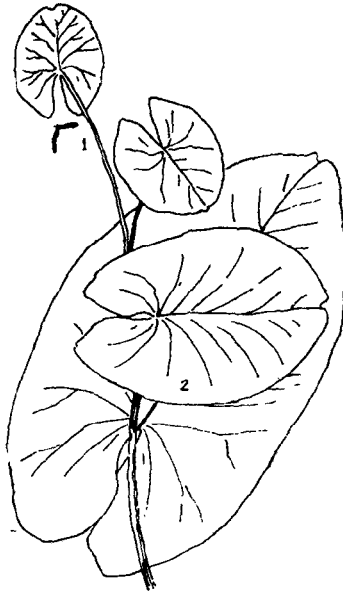
6



Nuphar

NUPHAR, also called Spatter Dock, resembles a water-lily in many respects. In a way, both are near-relatives, but Nuphars are a class by themselves. Botanically, Nuphar belongs to the family Nymphaeaceae and has large, heart or arrow-shaped leaves which either remain under water or, in some of the species, float on its surface. The flowers, generally yellow and rarely red or purple in some varieties, are borne well above the surface of water. The petals of the flowers, which are not very conspicuous, are innumerable, but the sepals, incurved or concave, may be five or more. Nuphar is found mostly in deep waters or rivulets where the water does not flow rapidly. Nuphar is not attractive when compared to a water-lily, but often the

leaves of some of the species lend charm to a large lily pond where many species and varieties of aquatic plants are represented. The other advantage is that Nuphar thrives in partially shady locations.



*Leaves of
Nuphar
showing
their under (1)
and upper (2)
surfaces*

Nuphar luteum is one of the better-known plants on account of its long flower bud, at times called Brandy Bottle. The small, lightly-scented flower, two to three inches across, has a bright yellow colour. The plant thrives in waters up to eight feet deep. The varieties *rubropetalum* and *Purpurea signata* or *punctatum* have red and purple flowers, respectively. *N. sagittae-folium*, *N. japonicum*, *N. pumilum*, *N. intermedium*—a hybrid, and other similar plants have very small, yellow flowers hardly $1\frac{1}{4}$ to two inches in diameter, and form the Nuphar class with five-sepal flowers. The flowers having more than five sepals belong to the class which consists of *Nuphar advena*, *N. polysepalum* and a few more. These have yellow flowers, slightly bigger in size than those with five sepals.

7

Bog Plants



The lily pool with all its exquisite water-lilies is a valuable component of a garden. To impart a more natural appearance to the pool, it is desirable to grow in the background certain plants which would grow in the vicinity of water or in the low-lying areas, or partially under water, with their stems, leaves and flowers remaining above the water surface in a graceful display. These are the bog plants which are adapted to grow under such marshy conditions. A few well-known species of such plants are mentioned below.

Sagittaria pleno of the water-plantain family (Alismaceae), commonly called Double Arrowhead and growing to about two feet, is a fine aquatic plant with spikes bearing beautiful white

double flowers. Other species of *Sagittaria*, such as *S. japonica*, *S. latifolia* and *S. sagittifolia*—the Common Arrowhead, are equally suitable for planting in the shelf of a lily pool. A taller variety that grows one foot to three feet is called the Giant Arrowhead.

Menyanthes trifoliata (Gentianaceae), known as Buckbean or Bogbean—a plant with creeping roots, does not grow higher than 9 to 18 inches. It produces fragrant white flowers fringed and suffused with a pink hue. Bogbean is well-adapted to shallow water cultivation.

Typha latifolia, of the cat's-tail family (Typhaceae), is popularly known as Cat's-tail because of its innumerable spikes. It grows to about four feet above water, so it is a plant for large pools. Some other species, *T. angustifolia*, *T. gracilis* and *T. minima*—a plant smaller than *T. latifolia*, are worth trying.

Nymphoides peltatum, another plant belonging to the Gentian family (Gentianaceae), also called Floating Heart due to its heart-shaped leaves, produces brilliant yellow flowers. Another species, *N. cordatum*, produces white flowers.

Butomus umbellatus, an aquatic plant from the flowering rush family (Butomaceae), is an erect plant growing a few inches out of water. Flowering Rush has thin, ribbon-like leaves. It presents a very pretty picture when the pink flowers bloom in profusion.

Myosotis palustris, or the Forget-me-not of water, belongs to the borage family (Boraginaceae). Due to its small size and adaptability to very shallow waters (three to five inches deep), it is an ideal bog plant. It produces small clusters of blue flowers with a yellow dot in the centre.

Calla palustris, from the arum family (Araceae), resembles the Calla Lily, but is smaller in size—hardly nine inches high. Bog Arum, with shining green, heart-shaped leaves, produces tiny white flowers in a spathe with the spadix resembling that of arum. Later, when the seed-pods ripen, they develop an attractive crimson colour.

Iris foliosa and *Iris pseudacorus*, representing the iris family (Iridaceae), have blue and yellow flowers, respectively. These are also known by their common names of Blue Flag and Yellow Flag and are suitable for growing in marshy spots. These can be grown in three to five inches of water. Other species,

I. fulva with reddish blooms, *I. laevigata* with a long deep blue 'standard', *I. alba* a white iris, and many species of water irises are suitable as bog plants.

Saururus cernuus, from the pepper family (Piperaceae), commonly called Lizard's-tail, has small, fragrant flowers on plants growing two to three feet above water.

Lobelia cardinalis, or Cardinal Flower, from the lobelia family (Lobeliaceae), so-called due to its red flowers, is an attractive plant grown in moist ground or slow-moving streams; *L. dortmanna* is a true aquatic plant and always remains under-water.

Lysimachia thyrsiflora belongs to the primrose family (Primulaceae), and is commonly known as Loosestrife. It is also called Tufted Loosestrife as its rose-coloured flowers are borne in thick tufts. An ideal plant for growing in low, moist locations.

Caltha palustris, one of the representatives of the buttercup family (Ranunculaceae) and known as Marsh Marigold, has rounded, dark green leaves with a wavy or cut edge. The bright yellow flowers of this plant place it in the class of attractive bog plants.

Pontederia cordata of the pickerel weed family (Pontederiaceae) is a pale blue flowering water plant. Its flowers are more or less similar to those of Delphinium and are borne on a spathe. The leaves are pointed, heart-shaped and arise from a central base. The plant is about two feet tall and suitable for shallow water planting.

Primula japonica of the primrose family (Primulaceae) is a water plant growing eight to 24 inches high. The flowers are purple. The varieties *alba* with white flowers, *rosea* with pale pink flowers, *lilacina* having lilac-coloured blooms, *splendens* with red spikes, and many more, are all useful water plants of great charm. *Primula japonica* loves moist soil and grows well under trees.

Primula denticulata, another member of the primrose family and growing in marshy places, is a common herb found in the Himalayas. It produces pale purple flowers on large heads. A pure white variety of *P. denticulata alba* and another variety of *purpurea* with deep purple flowers, are also hardy and easily cultivated.

Rodgersia podophylla (Saxifragaceae), with small yellow

flowers growing on a plant about two to three feet tall, is from China. The leaves, with fine leaflets, are seen mostly at the lower portion of the plant.

R. tabularis, also from China, is a plant taller than *R. podophylla*. It has small, white flowers.

Saxifraga peltata, also known as *Peltiphyllum peltatum* (Saxifragaceae), has the popular and suggestive name of Rockfoil. It is also called the Umbrella Plant. *S. peltata* grows from one foot to three feet high, with large, spreading, shield-shaped leaves. The flowers are pink or white in some plants. *S. peltata* var. *gigantea* is a bigger plant.

Acorus calamus variegatus belongs to the arum family (Araceae) and has the popular name of Variegated Sweet Flag. It has characteristic sword-like thin, straight leaves with beautiful white, pink and yellow lines on them. A very pretty plant for any pond. The Dwarf Sweet Flag is a smaller plant with green and white stripes on the leaves.

Peltandra virginica or, as it is commonly known, Arrow Arum (Araceae), is a plant with shield-shaped leaves. It grows about two feet high and bears white flowers resembling those of arum.

Nasturtium officinale (Cruciferae), from the cress family, is also known as Watercress. It thrives in shallow water. The round, oblong leaves remain under water, but the white flowers are borne above the water surface.

Alisma plantago (Alismaceae), also called Water Plantain, is a small plant with white or light pink flowers. Its leaves are heart-shaped, and it grows well in very shallow water.

Zizania aquatica, also known as *Z. palustris*, but with the popular name of Water-rice, belongs to the grass family (Gramineae). It grows in very tall clumps, often rising to about eight feet. The long thin leaves resemble those of the rice plant. The flowers and wild grains grow on handsome tall spikes at the end of the season. This is a very useful plant for growing on the edge of a very large pool. The plant is an annual. The grain is very good duck feed.

Colocasia (Araceae), also known as Taro, is a vigorous, shade-loving plant with broad, heart-shaped leaves. Imperial or Asiatic Taro has blotched dark brown leaves with a violet undersurface. Another variety has purple stems and is

recognized as Violet-stemmed Taro. There is also a variety called Green Taro with green stems.

Colocasia affinis, a rich-green-leaved species, is found growing wild in the Himalayas. All *Colocasia* species are marsh plants and would grow luxuriantly in bogs or swamps. They also thrive in open sunshine. *C. antiquorum* is another species good for growing in low-lying areas.

Cyperus papyrus, also known as Egyptian Paper Plant or Paper Rush, belongs to the sedge family (Cyperaceae). It is a very attractive plant with triangular stalks rising up to eight feet high.

Cyperus alternifolius or Umbrella Grass, also called Umbrella Palm, has a spready growth on slender stems. Both these species impart a distinguished effect to the planting scheme when planted on the edge of a water pool. There are other rare Russian and Chilean species of *Cyperus* which may be tried.

Myriophyllum proserpinacoides, better known by its popular name of Parrot's Feather or Water Milfoil, is a small plant from the water milfoil family (Haloragidaceae). The spreading stems of this plant have graceful green foliage. It is an ideal trailing plant for the edges of a pool.

Jussieua decurrens and *J. diffusa* of the evening primrose family (Onagraceae) are good edging plants for a pool. The flowers are bright yellow. *J. repens* is a creeping plant that spreads extensively on the surface of water. The small flowers are of a yellow hue.

Limnocharis humboldtii, more popular as Water Poppy, has heart-shaped deep green leaves. The flowers, yellow in colour and resembling the ground poppy, are borne a few inches above the water surface.

8

Floating Water Plants



WHILE considering the various species of water-loving plants, it will not be out of place to enumerate here some of those that thrive on the water surface. The roots of these plants do not touch the soil. They draw their nourishment from the water and remain afloat due to the special structures provided by nature.

Many of these floating aquatics have very handsome foliage and flowers. Some of them are a good source of food for the fish and help maintain the water clean by their special life processes. There are some obnoxious water weeds, such as certain types of algae, which the floating plants keep under control by preventing the sunlight from reaching their leaves.

Of the list that follows, some would be found useful for the aquaria in houses. Of course, many of these will have to be kept under control if, under healthy growing conditions, they try to spread very extensively in the pools. The best way would be to remove some of them every now and then.

Eichhornea crassipes major of the pickerel weed family (Pontederiaceae) has been considered an obnoxious weed, especially in Bengal, but it is one of the handsome, vigorous, floating plants. Water Hyacinth, to quote its popular name, has green, shiny leaves, which float on water due to its spongy bulbous leaf-stalks. The flowers, blue-purple with a violet centre, are borne on spikes. The mass of thin roots remains under the water surface. Though it is not considered a good source of food for the fish, they like its root system as it provides an ideal place for their eggs.

Limnobium spongia or Frogbit (Hydrocharidaceae) resembles a miniature water-lily. The flowers are small and white, and the leaves form a cluster of shining green.

Among some of the duckweeds, *Lemna minor* of the duckweed family (Lemnaceae) is an aquatic of very vigorous growth and, although a very good food for fish, it suffocates the growth of other desirable water plants. *L. trisulca*, an ivy-leaved duckweed, is preferable. It has pretty transparent fronds which help keep the pool water clear.

Salvinia braziliensis, a type of floating fern (Salviniaceae), is a fine floating water plant with small, round, green leaves and fine smooth hairs.

Utricularia vulgaris, popularly called Bladderwort (Lentibulariaceae), has fine leaves and also a small bladder-like device useful for catching insects. At the time of blooming, the plant rises to the surface of the water and produces attractive yellow flowers in profusion.

9



Oxygenators

IN a lily pool where vegetation and fish are to live in a natural balance, it is necessary to have a certain type of plant material which can be utilized by the fish. Secondly, many of these plants absorb waste from the animal population of the pond and in return give out oxygen so essential to the animal life in the water. This action normally takes place when sunlight is available. Therefore, overcrowding of pools and entire covering-up of the water surface should always be avoided. A limited use of the aquatics listed here may be made for indoor aquaria as well.

Sagittaria and its species *S. natans*, *S. sinensis* and *S. subulata*, from the water-plantain family (Alismaceae), are the best plants

for a pool where fish and plants are to live in healthy surroundings. *Sagittaria* is considered important as an efficient oxygenator.

Sagittaria, or Ribbon Arrowhead, has thin, green leaves resembling the blades of grass. The flowers which appear on the water surface are small and white, with a yellow mark in the centre. The normal method of multiplication is by runners and small bulbs which are developed at the base of the plants. *Sagittaria* also produces seeds.

Vallisneria spiralis from the frogbit family (Hydrocharidaceae), also called Wild Celery or Tape Grass, has thin, long leaves almost similar to those of *Sagittaria*, except that in this species the female flowers are borne on a stalk which rises out of the water in loops. The male flower is found on a separate plant. Due to its more graceful light green leaves this plant is very decorative. Besides, the capacity to produce oxygen is greater in *Vallisneria* as compared to *Sagittaria*.

Cabomba caroliniana, popularly called Fanwort, belongs to the family of water-lily (Nymphaeaceae), though there is hardly any apparent resemblance between the water-lily and *Cabomba*. The finely cut leaves and the pretty miniature-tree-like appearance place this aquatic among one of the more desirable water plants. Another species, *Cabomba rosaeifolia*, has beautiful reddish leaves and stems.

Anacharis or *Elodea* is also termed the Waterweed. It is from the frogbit family (Hydrocharidaceae), and is considered an undesirable plant by some on account of its vigorous growth. In a way, its luxuriant growth habit is an advantage for the pool, as it indicates an extremely high quality as an oxygenator. There are three good species of *Anacharis*: *A. canadensis*, *A. occidentalis* and *A. densa*, the last-named also known as *Elodea canadensis* var. *gigantea*.

Water Milfoil, as *Myriophyllum verticillatum* is known, is from the water-milfoil family (Haloragidaceae). The plants belonging to this family are attractive with varied forms of foliage. The thin, feathery, submerged leaves of Milfoil provide excellent space for the fish spawn. There are many species of *Myriophyllum* suitable for growing in large pools.

Eleocharis acicularis, Spike Rush or Hairgrass, a member of the sedge family (Cyperaceae), as its common name suggests,

is an aquatic plant resembling very thin grass, with small spikes of flowers growing on very slender stalks. There are innumerable species of *Eleocharis* all of which cannot be recommended. However, it would be good to obtain any local species for the small pond or lily pool.

Ludwigia, from the evening primrose family (Onagraceae), also mentioned as Swamp or False Loosestrife, is a very interesting plant. The undersides of the leaves of *Ludwigia* turn red when exposed to sunlight. This characteristic makes *Ludwigia* a good pool plant for an aquarium where the glowing beauty of the lower leaf surface can be admired through a clear glass container. *L. arcuata*, *L. lacustris*, *L. polycarpa* and *L. linearis* are worth introducing from abroad.

Some plants of the Nuphar family would also serve as fairly good oxygenators. *Fontinalis gracilis* (Willow Moss), *Herpestis amplexicaulis*, Moneywort or *Lysimachia nummularia*. Lace Plant or *Ouvirandra fenestralis*, *Limnocharis humboldtii* (Water Poppy), *Riccia fluitans* or Crystalwort—one of the very good oxygenators, *Trianea bogotensis*, *Hydrocharis morsus-ranae* (Frogbit), *Pistia stratiotes* (Water Lettuce)—a very decorative plant forming a small rosette of leaves, *Ceratopteris thalictroides* (Water Fern)—a plant that resembles a particular species of fern where the new young plants grow on the leaf-edges, are a few of the aquatics that help maintain the clarity of a lily pool abounding in fish.

The plants listed above, if large, may be planted on the bottom of the pool in a two-inch layer of sand; some may be planted in small, flat pots or trays and submerged. The very small ones may be left floating or partially immersed in water; these would automatically settle down in their proper positions.

The plants have to be selected carefully, keeping in view their growth habits and the depth and size of the pool. No doubt, floating plants add to the beauty of the pool, but they multiply so fast that constant thinning becomes essential. In certain parts of India, it would be unwise to introduce some of the more prolific species, such as the Water Hyacinth (*Eichhornea*). Quite a number of village pools, and even large lakes, have been rendered useless by such plants, entailing considerable effort and expenditure on their eradication.

10



Planting

THERE are two ways of planting an aquatic garden pool. One is to fill the entire tank with about one foot deep layer of heavy loam or clay mixed with liberal quantities of farmyard manure and to set the plants in this made-up soil. The other is to use large-sized boxes (for the largest varieties of plants, a good size would be $2\frac{1}{2}$ ft. \times $2\frac{1}{2}$ ft. \times $2\frac{1}{2}$ ft.) filled with compost and heavy loam in the proportion of 1 : 2 mixed with a liberal dose of bonemeal.

Planting of water-lilies in shallow pools, such as those constructed at Chandigarh, the new capital of the Punjab, presents a new problem : as the water is only a few inches deep, it is not possible to use planting-boxes, nor can the pools be

filled with a layer of soil as that will defeat the very purpose for which they are being constructed,* viz., reflecting the buildings. For such pools, the best method is to dig pits in the pools and build them up with concrete. The size $2\frac{1}{2}$ ft. \times $2\frac{1}{2}$ ft. \times $2\frac{1}{2}$ ft. would be suitable. These pits can be filled with soil up to $2\frac{1}{2}$ feet and the plants planted in it; the remaining six inches can be filled up with clean coarse gravel, which will prevent the soil from coming up, and thus obliterate the presence of a pit.

The filling up of the bottom of the pool is very convenient for planting the aquatics. No special attention is needed for a long time after planting. However, it is found that eventually the varieties run into each other and the pool presents a wild appearance, to correct which considerable effort is required. The advantage of planting in boxes is that, on the one hand, all the varieties are kept separate from each other and, on the other, frequent rearrangement of the water garden is possible. The only drawback is that the plants have to be taken out whenever the soil is to be renewed and that, to get the best results, has to be done at least once a year. The replenishment should be done in winter, say, in February, in the plains, and at the end of March on the hills. The soil taken out of the boxes makes excellent manure for flower beds.

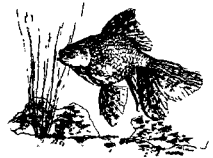
Blooms and leaves in general and seed-pods in particular, when they wither, should be removed from the plants. This makes the plants throw out more blooms. However, no harm is done even if these are not weeded out.

A question is often asked whether water-lilies can be grown in running water. There are varieties which can be cultivated in streams. In fact, any variety of a water-lily will survive and flourish in flowing water so long as the flow is moderate enough to let the plant keep its leaves right side up. If the leaf is overturned or submerged, the current should be considered too fast. Rightly speaking, it is a question of proper selection of varieties for different streams. There is, however, no denying the fact that water-lilies do best in still waters that keep a warm and even temperature.

Fountains do not really interfere with water-lily cultivation, except the forceful sprays that might cause mechanical injury to the delicate leaves. It is, therefore, advisable to keep the plants away from the reach of showers.

In pools having a natural mud-bottom, the plants can be set straight in the ground.* But the soil should be manured adequately before planting. Underwater plants should also be planted liberally to keep the water from going dirty due to the growth of algae. It is also advisable not to mix varieties, for they would eventually get so intermingled that it would be hard to separate them. Another point to remember is that some varieties leave their rhizomes so deep in the soil that it is not easy to get at them, and they keep on coming up persistently even when not wanted. A proper selection of varieties is, therefore, essential for planting in natural pools. If judiciously planted, a natural pool would give very good results without needing much attention.

Fish in Lily Pools



IT is a good principle to combine fish-keeping with water gardening. Not only do the fish add life to the tranquil beauty of a lily pool but they also keep the water clear and healthy.

The goldfish (*Carassius*), of which there is a large variety to choose from, is generally preferred, for besides being very attractive, it thrives as well in the plains as it does on the hills. In making a selection, the type and size of the pool must be taken into consideration.

For open outdoor pools, ordinary goldfish is to be preferred to the fancy varieties, as it is hardier and more agile and can, therefore, protect itself better against natural enemies. The fancy varieties, on the other hand, would eminently

suit either pools having a protective wire-covering, or indoor aquaria.

Carp (*Cyprinus carpio*) and other table fish can be kept in larger pools. Of all the carps, the mirror carp grows the fastest. It is a foreign fish that has now established itself in the Nilgiris, the Kumaon hills and many parts of Himachal Pradesh. It is bred in hatcheries in all the three places and can be had in any number. It is worth introducing into the other parts of the country as well.

There are several tropical fishes which live exclusively on insects and larvae, and which might be kept with advantage in village ponds where mosquitoes breed freely. However, it should be remembered that these fishes would not combine well with the smaller and gentler species as they would start preying on them. Therefore, fish like Gouramies, Mollies, etc., should not be kept where it is proposed to have the vegetarian types. If frogs become a nuisance in the pool, the Murrel or *Wallagonia*, which are also good for table purposes, may be kept instead of carps. They would eat up the frogs. However, neither of them can live with any other fish as they are highly carnivorous.

Whatever the variety of fish kept in the pool, proper attention must be paid to their food. The vegetarian types would no doubt live satisfactorily on some of the water plants, but the natural supplies may run short even for them when they multiply. In the case of the other varieties, it is obviously necessary to provide proper rations. A convenient feed, which is relished by the fish, is bloodmeal. Bloodmeal is prepared by kneading blood and bran in equal proportions. It may be fed by rolling it into small pellets and throwing these into the pool; or, a big ball of it may be deposited in a selected corner of the pool so that the fish may help themselves with it. Alternatively, plain grain flour mixed with boiled potatoes may be used.

Pisciculture is an extensive subject, and it will be outside the scope of this small book to discuss it in detail. Those interested may refer to any standard work on the subject. For our purpose, it would be sufficient to emphasize the desirability of stocking water gardens with ~~selected varieties~~ of fish for beauty as well as utility.

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READERS desiring to pursue the subject in greater detail may refer to the following works.

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