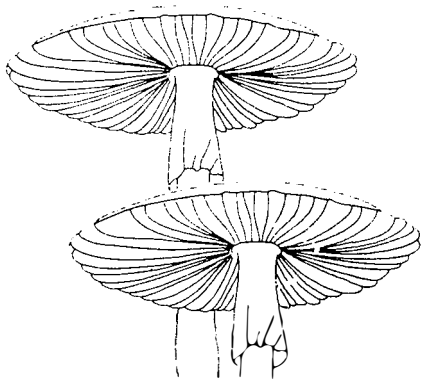

PLUTEACEAE ROZE - A BRIEF REVIEW

PLUTEACEAE ROZE - A BRIEF REVIEW

The pink spored family Pluteaceae Roze is unique among agaricales due to its inverse hymenophoral trama with convergent hyphae. The characters of this family are specific rather than general. However the generic concepts vary between workers.

The genera now included under the family Pluteaceae Roze viz., *Volvariella* Speg., *Chamaeota* (W. G. Smith) Earle and *Pluteus* Fr. were earlier included in the tribe *Pluteeae* of the family Amanitaceae (Singer, 1962). Later these genera were treated under Volvariaceae family and Pluteaceae included the genera *Amanita* Pers. and *Limacella* Earle (Singer, 1975). Singer (1975) later transferred *Amanita* Pers. and *Limacella* Earle to Amanitaceae while *Volvariella* Speg., *Chamaeota* (W. G. Smith) Earle and *Pluteus* Fr. were kept under Pluteaceae.

Pegler (1977) included five genera viz., *Volvariella* Speg., *Pluteus* Fr., *Termitomyces* Heim, *Amanita* Pers. and *Limacella* Earle in the Pluteaceae. Later Pegler (1983) followed Singer (1975) by shifting *Amanita* Pers. and *Limacella* Earle to Amanitaceae and *Volvariella, Chamaeota* and *Pluteus* were retained in the Pluteaceae. Pegler (1986) accomodated the genus *Termitomyces* Heim within Pluteaceae, based on its pluteoid habit, rapidly decaying densely crowded free lamellae, the pink spore deposit, the type of hymenial cystidia and the spore wall with two teguments and the presence of an open pore hilum. However, Singer (1986) placed *Termitomyces* Heim in the tribe *Termitomyceteae* in family Tricholomataceae close to the tribe *Lyophylleae* based upon the presence of siderophilous granulation detected in the basidia.

In the present treatise, Singer's (1986) concept of the family Pluteaceae Roze with three genera viz., *Volvariella* Speg., *Chamaeota* (W. G. Smith) Earle

and *Pluteus* Fr. is essentially followed. A total of fifty three taxa belonging to the genera *Volvariella* Speg. and *Pluteus* Fr. are described in the present work. No *Chamaeota* (W. G. Smith) Earle species could be collected. A brief review of literature and the various characters used in the taxonomy of *Volvariella* Speg. and *Pluteus* Fr. are discussed in the following pages.

VOLVARIELLA Speg.

The genus has been known by four names since the starting point of nomenclature for the agaricaceous fungi. The latin word "volva" is the base for three of these names: *Volvaria, Volvariopsis, Volvariella* and the fourth is *Pseudofarinaceous* (Shaffer, 1957).

Fries (1821) used *Volvaria* for his "tribe" containing pink-spored volvate agarics with free lamellae and Kummer (1871) raised *Volvaria* to generic rank. However, De Candole (1805) had previously described a lichen genus and named it as *Volvaria*. *Volvaria* DC. (1805) antedates *Volvaria* (Fr.) Kummer led Earle (1909) to resurrect *Pseudofarinaceous* for the agaric genus. This name however had been used by Kuntze (1891) for the white spored genus now known as *Amanitopsis* Roze. Murrill (1911) then published the *Volvariopsis* for the pink spored genus (Shaffer, 1957).

Donk (1949) was apparently the first to suggest that the use of *Volvariopsis* was endangered by *Volvariella* Speg. Spegazzini described *Volvariella* (Type: *V. argentina* Speg.) in 1899 and considered it as different from *Volvaria* in having a cartilaginous stipe and the pileus and stipe continuous. However, according to Patouillard (1900) and Singer (1950), these differences do not warrant the recognition of a separate genus and the type is a true *Volvaria* (Shaffer, 1957). *Volvariella* Speg. therefore replaced *Volvariopsis* Murr.

Several important contributions to the taxonomy of *Volvariella* Speg. which appeared from nineteenth century include those of Lloyd (1898, 1899a, b), Murrill (1911, 1917, 1938, 1942, 1949, 1951), Harper (1916), Rea (1922), Heim (1936),

Ramsbottom (1942), Smith (1945), Shaffer (1957,1962), Pilat (1959), Orton (1960, 1974, 1986), Dennis (1970), Heinemann (1975, 1978), Pathak (1975), Courtecuisse (1984), Singer (1955, 1989b) and Vellinga in Bas et al (1990).

It was Berkeley (1850, 1882) who worked on the agarics of this subcontinent, described several new agarics from north-eastern states and it included one species of *Volvariella* Speg. Massee (1899, 1912) described two species of *Volvariella* Speg. from Maharashtra. Hennings (1901) described three species of *Volvariella* Speg. from Uttar Pradesh. Bose (1920) who studied the Agaricaceae of Bengal came across two species of *Volvariella* Speg. It is followed by several sporadic reports on *Volvariella* Speg. from different parts of the country by Ghosh et al (1967), Sing & Mehrotra (1974), Rangaswami (1956, 1978) Pathak et al (1978) Natarajan (1978), Sathe & Kulkarni (1983), Sathe & Rahalkar (1978), Saini et al (1983), Manjula (1983), Verma et al (1983), Natarajan & Purushothama (1987), Purkayastha & Chandra (1985), Manimohan et al (1988), Abraham (1994) and Atri et al (1996).

The species of *Volvariella* Speg. are primarily separated on the basis of macrocharacters such as habit, habitat, size, colour, nature of pileus, volval characters and microscopic characters, mainly spore size. The different macro and microscopic characters that are used for the specific and infraspecific delineation of taxa in *Volvariella* Speg. are discussed below.

In *Volvariella* Speg. the basidiome size is often very variable from very small as in *Volvariella pusilla* (Pers. : Fr.) Sing. (= *V. parvula*) to robust as in *Volvariella bombycina* (Schaeff.: Fr.) Sing., and can be diagnostic in some cases. Habitat in *Volvariella* Speg. is considered as a good diagnostic character for the species level delineation (Orton, 1974, 1986; Pegler, 1986). *Volvariella glandiformis* (Berk. & Br.) Pegler and *Volvariella pusilla* (Pers. : Fr.) Sing. (= *V. parvula*) are good example for this. These two species are primarily separated by the lignicolous habitat of the former from the terrestrial habitat of the latter. According to Orton (1974), as in many other agaric genera, habitat is a good diagnostic character in *Volvariella* Speg. to delimit taxa.

The basidiome colour in this genus is mostly some shade of brown, however white and yellow species are also encountered. The colour of the pileus and the surface features together with the extent of dryness or viscidity are considered the most important macromorphological characters used for the delineation of *Volvariella* Speg. species.

The size, shape and attachment of stipe is constant for the genus and considered as a character of minor importance. However, the surface features of the stipe is often found useful as in the case of *Volvariella hypopithys* (Fr.) Moser (Orton, 1986), where the heavily pubescent stipe is diagnostic for that species. The various generic name proposed for the genus (*Volvaria, Volvariopsis, Volvariella*) is based on the presence of the universal veil-the volva. The size, shape, nature, colour and surface features of the volva is taxonomically significant and used by various workers to delimit taxa at specific and infraspecific level (Shaffer, 1957; Orton, 1986; Vellinga in Bas et al, 1990).

The colour of the spore print is always pink and varies from sordid pink to brownish pink (Singer, 1986) and therefore is of no taxonomic significance at infrageneric level. However, the spore shape which varies from ovoid to ellipsoid and spore size are the most useful microscopic character used for specific and infraspecific separation in *Volvariella* Speg.. The spores of *Volvariella* Speg. are invariably cyanophilic and inamyloid. The basidia in *Volvariella* Speg. is always clavate and 4-spored and is of no taxonomic significance.

In *Volvariella* Speg. both cheilocystidia and pleurocystidia are present. According to Orton (1986), the hymenial cystidia in *Volvariella* Speg. are too variable to be used for species separation. However, in *Volvariella nigrodisca* Shaffer (1962), the much strangulated hymenial cystidia are used for its separation from other closely related taxa.

The hymenophoral trama of this genus is inversely bilateral with convergent hyphae and no taxonomic information at the infrageneric level can be deduced from it.

The structure of the pileipellis in this genus is an epicutis of parallel hyphae or often suberect and without cystidioid elements. Therefore the structure of pileipellis in *Volvariella* Speg. provides no taxonomic information at the infrageneric level. However, rarely, as in the case of *Volvariella nigrodisca* Shaffer (1962), the cystidioid elements when present is useful for species separation. The presence or absence of intracellular pigments in the pileipellis is taxonomically significant (Orton, 1986).

Clamp connections and caulocystidia are absent in the genus. The presence, abundance and distribution of oleiferous hyphae have not been considered significant by any of the workers (Shaffer, 1957; Orton, 1974, 1986; Vellinga in Bas et al, 1990).

ECOLOGY

The members of the genus *Volvariella* Speg. are found on a wide variety of substrates. Most of them are terrestrial or humicolous. Nevertheless a few species are found on dead, decaying wood, dung, straw or even on other agarics (Singer, 1975).

ECONOMIC IMPORTANCE

Economically the genus has much value as *Agaricus*. The culture of *Volvariella volvacea* (Bull. : Fr.) Sing. and *Volvariella diplasia* (Berk. & Br.) Sing. in the tropics have the same status of *Agaricus bisporus* culture in temperate regions (Singer,1986). The species of this genus is widely grown in many Asian countries.

GEOGRAPHICAL DISTRIBUTION

The genus is cosmopolitan in distribution and have been reported from tropical, subtropical and temperate regions of the world (Shaffer, 1957). Several reports are available on its wide geographical coverage: North America (Murrill, 1911, 1917, 1938, 1949; Shaffer 1957, 1962), England (Orton, 1960, 1974, 1986), Central Africa (Pathak, 1975), Venezuela (Dennis, 1970), Michigan, USA (Smith & Bartelli, 1965) South east Asia (Heinemann, 1975, 1978), Kenya, Uganda,

Tanzania (Pegler, 1977), Martinique, Guadeloupe, Trinidad, Dominica (Pegler, 1983), Sri Lanka (Petch, 1907; Pegler, 1986), Netherlands, Africa, West Germany (Vellinga in Bas et al, 1990), France (Courtecuisse, 1984), Japan (Courtecuisse et al, 1991) Illinois, USA (Monoson et al, 1993).

From India, only sixteen species are so far reported (Table - I) and only one species from Kerala.

INFRAGENERIC CLASSIFICATION IN *VOLVARIELLA* SPEG.

None of the workers (Shaffer, 1957, 1962; Orton, 1974, 1986; Singer, 1986, 1989b; Vellinga in Bas et al, 1990) have proposed any subgenus or sections within the genus *Volvariella*.

PLUTEUS Fr.

The genus *Pluteus* Fr., is a large group of nonmycorrhizal mushrooms with more than 150 species were known from the world (Singer, 1986). Many important contributions to the taxonomy of the genus include those of Fayod (1889), Murrill (1917), Lange (1917) Rea (1922), Kuhner & Romagnesi (1953), Singer (1956, 1958, 1959, 1961, 1989a, b) Pearson (1952) Smith & Stuntz (1958), Horak (1964), Homola (1972), Hongo (1976), Orton (1960, 1986), Vellinga & Schreurs (1985), Courtecuisse (1985, 1991), Courtecuisse et al (1991), Vellinga in Bas et al (1990), Bonnard (1991, 1993, 1995) and Banerjee & Sundberg (1993a,b, 1995).

Berkeley's description (1850, 1852) included three species of *Pluteus* from the North Eastern states of India. Moses (1948) recorded a single species from Gujarat. It is followed by several sporadic reports by various workers include those of Trivedi (1972), Ghosh et al (1974), Sathe & Rahalkar (1977) Sathe & Deshpandae (1980), Watling & Gregory (1980), Natarajan & Raman (1980), Natarajan & Purushothama (1987), Horak (1980), Sathe & Kulkarni (1980,1983), Purkayastha & Chandra (1985) and Abraham (1994).

Many *Pluteus* Fr. taxa look similar externally, however closer examination readily permits delineation of taxa in the genus. The species of *Pluteus* Fr. are separated firstly according to the structure of the pileipellis ie., filamentous, cellular or mixed and then on pileus and stipe colours, habitat or size of the fruit body. The size and shape of hymenial cystidia, presence or absence of dermatocystidia and spore detailes were also used for species separation. Some of the important characters used in the taxonomy of *Pluteus* Fr. are discussed below.

The basidiome size in *Pluteus* Fr. is often variable due to differences in age and environment and it can be used as diagnostic in some cases.

Specimens of *Pluteus cervinus* (Schaeff.: Fr.) Kumm., *Pluteus magnus* Mc Clatchie and *Pluteus petasatus* (Fr.) Gill. and some other species are observed to be very large (Banerjee & Sundberg 1995). The size of the basidiome together with surface features of pileus are used for specific level delineation by many workers (Singer, 1956, 1958; Orton 1986; Banerjee & Sundberg, 1995).

The commonly encountered pileus colour in this genus is brown or some shade of brown. However white and brilliantly coloured species with yellow or red are also found (Singer, 1958; Orton, 1986).

The nature and surface features of the pileus vary widely between species and considered taxonomically significant. The surface of the pileus varies from smooth, glabrous to fibrillose squamulose, squamulose, atomate pruinate, rugulose, veined and are closely related to the structure of the pileipellis, which in turn of atmost importance at infrageneric delineation. The hygrophanous nature of pileus is rarely observed in the genus and none of the workers have given any significance.

The insertion and colour of the lamellae is always free and pink and is taxonomically of little value. However yellow lamellae are also encountered in species like *Pluteus splendidus* Pearson, *Pluteus luteovirens* Rea and in some other species also of value according to the merit of each case. In *Pluteus* Fr.

coloured lamella edge (marginate) is considered taxonomically significant and used for species separation by Singer (1956, 1958), Homola (1972), Banerjee & Sundberg (1993a, b, 1995). However, according to Pegler (1983) care must be taken in using coloured lamella edge as a reliable taxonomic character because of its inconstancy within one species.

Though the size of the stipe is directly proportional to the size of the pileus no taxonomic information can be deduced out of it. The colour together with the presence or absence of basal mycelium has been considered significant (Singer, 1958; Orton, 1986; Homola, 1972).

The colour of the spore-print in *Pluteus* Fr. is constant and always pink and varies from pink to pinkish brown (Singer, 1986) is therefore of no value at infrageneric delimitation. In this genus the spores are generally plentiful and rather durable due to the slight thickening of the spore wall and can be easily recognized (Singer, 1956). Mostly the spores are globose to subglobose, however ovoid, ellipsoid to rarely subcylindric spores are also encountered in this genus (Singer, 1986). According to Singer (1956) the absolute measurements of the spores are often of little value and should be used with caution and on the merit of each particular case, since many species have spores of widely differing sizes. This does not, however, mean that spore size is never a useful taxonomic character for *Pluteus* Fr. The nature of the spore wall together with the fragility of the spore wall are taxonomically significant (Smith & Stuntz, 1958; Banerjee & Sundberg, 1995). The other taxonomically useful character of the spores are the presence or absence of a conspicuous hilar appendix and size dimorphism (Banerjee & Sundberg, 1995). The spores of *Pluteus* Fr. is invariably cyanophilic and inamyloid (Singer, 1972, 1986).

The presence, size, shape and frequency of cheilocystidia are considered taxonomically significant and used to delimit taxa by modern workers. According to Orton (1986), cheilocystidia are of critical value in species separation when pleurocystidia were absent. The presence of intracellular pigments in the cheilocystidia were used by various workers for delimitation of taxa at specific and infraspecific level (Singer 1958; Homola, 1972). Banerjee & Sundberg (1995)

observed dimorphic type of cheilocystidia and according to them it is of taxonomic value. In the genus, cheilocystidia are mostly thin-walled, however, in *Pluteus amphicystis* Singer (1958) rarely thick-walled cheilocystidia are also observed and found to be taxonomically significant.

Among the microscopic characters, pleurocystidia were found to be significant in infrageneric separation. The presence, size, shape and frequency of pleurocystidia in the genus has been widely used by most workers to delimit taxa at various level (Fayod, 1889 ; Kuhner & Romagnesi, 1953 ; Singer, 1956, 1958; Smith & Stuntz 1958 ; Orton, 1986; Vellinga in Bas et al 1990 ; Banerjee & Sundberg, 1993a , b, 1995). Pleurocystidia are always thick walled and metuloidal in section *Pluteus* and thin walled and non metuloidal in the section *Hispidoderma* and section *Celluloderma.* The metuloidal pleurocystidia are of two types; Cervinus type in which apical horns are present and those without apical horns are referred to as magnus type and used for taxa delimitation (Banerjee & Sundberg, 1995). In *Pluteus* Fr. the subhymenial layer is either formed of interwoven hyphae or pseudoparenchymatous. According to Singer (1958) it could also may help in elucidating some problems at the specific level. Neverthless none of the workers have made use of it for specific or infraspecific delineation.

The hymenophoral trama in *Pluteus* Fr. is inversely bilateral with convergent hyphae and no taxonomic information can be deduced at the infrageneric level.

The structure of the pileipellis with its nature and topography of pigments have been used by most workers for infrageneric level separation of taxa in *Pluteus* Fr. and is one of the major microscopic character used for infrageneric delimitation. The sectional and subsectional concepts in the genus is basically dependent on the structure of the pileipellis. In the section *Pluteus* and section *Hispidioderma* Fayod the pileipellis is either an epicutis or a trichoderm. However, in section *Celluloderma* the elements composing the surface layer of pileus are ellipsoid to saccate pyriform to vesiculose cells. The presence or absence of cystidioid elements in the pileipellis subdivide the section *Celluloderma* in to two subsections, subsection *Mixtini* with cystidioid elements and subsection *Eucellulodermini* without cystidioid elements. This has been of considerable value for separation of taxa at various level.

The importance given to the presence or absence of clamp-connections in the pielipellis hyphae and its taxonomic significance vary between workers. According to Singer (1958), Homola (1972), Vellinga in Bas et al (1990) and Banerjee & Sundberg (1995), clamp-connections in the pileipellis hyphae is an important delimiting character. However, Smith & Stuntz (1958) and Orton (1986) are of the opinion that clamp-connections are often very rare and their constancy within one species is doubtful and therefore be used with caution in taxa delimtation.

The stipe trama in *Pluteus* Fr. is composed of parallel thin-walled hyphae and no taxonomic information can be deduced from it. The presence, structure, frequency and pigmentation of caulocystidia were considered significant by Homola (1972), Orton (1986), Banerjee & Sundberg (1995). However earlier workers like Singer (1956, 1958) and Smith & Stuntz (1958) have not mentioned anything about caulocystidia.

ECOLOGY

The genus *Pluteus* Fr. is cosmopolitan in distribution and the members are mostly lignicolous, however terrestrial species are also present. *Pluteus* Fr. contains no mycorrhizal species (Singer, 1986).

ECONOMIC IMPORTANCE

Some of the *Plutei* (*P. cervinus* & related species) are excellent edible species, but never sold commercially and are usually eaten only when other more tasty species are not available (Orton, 1986). The wood destroying properties of some species are limited to previously decayed dead wood or at least dead tissue on living trees. The bluing species like *Pluteus salicinus* (Pers.: Fr.) Kumm. and its complex are probably hallucinogenic (Singer, 1986).

GEOGRAPHICAL DISTRIBUTION

Pluteus Fr., is a large group of presumably non-mycorrhizal mushrooms found on all continents excepting Antartica (Singer, 1986). A number of reports are available on its wide geographical distribution: Central, North and South America (Walker, 1919; Murrill, 1911, 1941, 1943, 1946; Singer, 1956, 1989a; Smith & Stuntz, 1958; Homola, 1972; Banerjee & Sundberg, 1993a, b, 1995), Cuba (Singer, 1956, 1958), Argentina (Singer, 1956, 1958; Horak, 1964), Trinidad (Singer, 1956, 1958, 1989b; Pegler, 1983), Canada (Singer, 1956), Brazil (Singer, 1958, 1989b), Sri Lanka (Petch, 1912, 1917; Singer, 1956; Pegler, 1986), USSR (Singer, 1956), Jamaica (Singer, 1958; Pegler,1983), Bolivia (Singer, 1958), Venezuela (Singer,1961; Dennis, 1970; Pegler, 1983), Netherlands (Vellinga & Schreurs, 1985; Vellinga in Bas et al, 1990), Africa (Pegler, 1966, 1977), England (Rea,1922; Dennis, 1948; Pearson, 1952; Reid, 1958; Orton, 1960,1986) Japan (Singer, 1989b), Mexico (Rodriguez et al, 1997), Papua-New Guinea (Hongo, 1976), Thailand (Courtecuisse, 1991), Austria (Lohmeyer et al, 1994), Martinique, Guadeloupe, Grenada (Pegler, 1983), Tanzania, Kenya (Pegler, 1977), Korea (Lee et al, 1992).

So far only 16 species are known from India (Table-II) and only one species from Kerala.

INFRAGENERIC CLASSIFICATION IN *PLUTEUS* Fr.

In the genus *Pluteus* Fr. none of the workers proposed any subgenus and only sections and subsections were proposed. The sectional and subsectional concepts in the genus vary among workers. However, all sectional and subsectional concepts were basically dependent on the structure of the pileipellis and nature of pleurocystidia.

Fayod (1889) proposed three sections viz., *Celluloderma, Trichoderma* and *Hispidoderma* based on pileipellis structure and nature of pleurocystidia (Singer, 1956) however included only two sections, *Trichoderma* and *Celluloderma* in his

classification. In each of these two sections Singer (1956) proposed two subsections each. Section *Trichoderma*, subsection *Cervini* is characterised by the metuloidal pleurocystidia while, subsection *Hispidodermini* with thin-walled, non metuloidal pleurocystidia. In section *Celluloderma* subsection *Mixtini* is characterised by integrading cystidioid elements along with pyriform, clavate to spheropendunculate cells and subsection *Eucellulodermini* with only one type of cells, without intergrading cystidioid elements. Later Singer (1958) accepting the three sections, however section *Trichoderma* has been changed by section *Pluteus*. The subsections proposed earlier in the section *Trichoderma* was abandoned and subsection *Hispidodermini* has been changed to section *Hispidoderma*. However, the section *Celluloderma* with its subsection *Mixtini* and subsection *Eucellulodermini* have been retained without alteration.

Most of the workers accepted and followed Singer's (1958) classification (Smith & Stuntz, 1958; Homola, 1972; Orton, 1986; Banerjee & Sundberg, 1993 a, b, 1995). However Vellinga and Schreurs (1985) and Vellinga in Bas et al (1990) essentially accepting the three sections, the section *Hispidoderma* has been replaced by section *Villosi*, characterised by a differentiated cutis combined with thin-walled pleurocystidia. Moreover Vellinga & Schreurs (1985) proposed one more subsection in the *Celluloderma,* inadditon to the subsections *Mixtini* and *Eucellulodermini*. According to these authors, the species having a pileipellis with the combination of clavate to spheropedunculate elements and elongate fusiform elements is not properly placed and earlier it was included in the section *Celluloderma*. Therefore Vellinga & Schreurs (1985) proposed subsection *Hispidodermini* to accommodate those species with a pileipellis consisting of cylindrical to fusiform elements. However, none of the workers (Orton, 1986; Pegler, 1986; Banerjee & Sundberg, 1993 a, b, 1995) accepted this system of infrageneric classification of *Pluteus* Fr.

In the present treatise, the author follows essentially the classification proposed by Singer (1956, 1958, 1986) both for family and infrageneric level classification.

Table - I

SPECIES OF *VOLVARIELLA* RECORDED FROM DIFFERENT PARTS OF INDIA

No	Species	Locality	Author & Year
1.	*V. bombycina*	Uttar Pradesh	Ghosh et al, 1967 Pathak et al, 1978 Sing & Mehrotra, 1974
2.	*V. castanea*	West Bengal Maharashtra Jammu & Kashmir Uttar Pradesh	Massee, 1912 Sathe & Kulkarni, 1983 Abraham, 1994 Pathak et al, 1978
3.	*V. diplasia*	West Bengal Uttar Pradesh Maharashtra	Bose, 1920 Pathak et al, 1978 Sathe & Kulkarni, 1983
4.	*V. earlei*	Punjab	Atri et al, 1996
5.	*V. hypopithys*	Jammu & Kashmir Punjab	Abraham, 1994 Saini et al, 1983
6.	*V. indica*	Uttar Pradesh	Pathak et al, 1978
7.	*V. liliputiana*	Uttar Pradesh	Hennings, 1901 Pathak et al, 1978
8.	*V. media*	Uttar Pradesh	Hennings, 1901 Pathak et al, 1978
9.	*V. parvula*	Tamil Nadu	Natarajan, 1978
10.	*V. pusilla*	Uttar Pradesh	Ghosh et al, 1967
11.	*V. pseudovolvacea*	Karnataka	Natarajan &Purushothama, 1987
12.	*V. speciosa*	Uttar Pradesh Maharashtra Jammu & Kashmir	Ghosh et al, 1967 Pathak et al, 1978 Sathe & Kulkarni, 1983 Abraham, 1994
13.	*V. terastia*	West Bengal Uttar Pradesh Kerala	Bose, 1920 Pathak et al, 1978 Manimohan et al, 1988
14.	*V. thwaitesii*	Uttar Pradesh West Bengal	Pathak et al, 1978 Berkeley, 1850
15.	*V. volvacea*	Uttar Pradesh Maharashtra	Hennings, 1901 Patak et al, 1978 Sathe & Kulkarni, 1983
16.	*V. woodrowiana*	Maharashtra Uttar Pradesh	Massee, 1899. Pathak et al, 1978.

Table - II

SPECIES OF *PLUTEUS* RECORDED FROM DIFFERENT PARTS OF INDIA

No	Species	Locality	Author & Year
1.	*P. albostipitatus*	Karnataka	Natarajan & Purushothama, 1987
2.	*P. atricapillus*	Maharashtra	Sathe & Deshpandae, 1980 Sathe & Kulkarni, 1983
3.	*P. cervinus*	Gujarath Uttar Pradesh Jammu & Kashmir Tamil Nadu	Moses, 1948 Ghosh et al, 1974 Watling & Gregory, 1980 Natarajan & Raman, 1980
4.	*P. chrysoprasius*	Sikkim	Berkely, 1850
5.	*P. curtisii*	Karnataka	Natarajan & Purushothama, 1987
6.	*P. cuspidatus*	Assam	Berkeley, 1852
7.	*P. cubensis*	Karnataka	Natarajan & Purushothama, 1987
8.	*P. fuliginosus*	Karnataka	Natarajan & Purushothama, 1987
9.	*P. lutescens*	Sikkim	Horak, 1980
10.	*P. martinicensis*	Kerala	Pradeep et al, 1996
11.	*P. nanus*	Maharashtra	Trivedi, 1972
12.	*P. palumbinus*	West Bengal	Berkeley, 1850
13.	*P. psichiophorus*	Jummu & Kashmir	Abraham, 1994
14.	*P. romelli*	Jummu & Kashmir	Abraham, 1994
15.	*P. salmoneus*	Karnataka	Sathe & Kulkarni, 1980
16.	*P. subcervinus*	Tamil Nadu	Natarajan & Raman, 1980