Chapter - 2

REVIEW OF LITERATURE

Wetlands are lands transitional between terrestrial and aquatic system where the water table is usually near or at the surface or the land is covered by shallow water. Wet land habitats support a variety of avifauna. Wetland birds have long attracted the attention of the public and scientists because of their beauty, abundance and recreational and economic importance. Recently they have become of interest as indicators of wetland quality and as parameters of restoration success and regional biodiversity (Weller, 1999).

According to Weller and Spatcher (1965) wetland birds are adapted to the fluctuating environmental conditions of their habitats. Beecher (1942) opined that different water depths and vegetation within a wetland favours the highest diversity of avian species.

Family Rallidae of class the Aves represents a number of wetland associated species of birds with a world wide distribution (Ripley, 1977).

Various workers have studied the habitats and distribution of many wetland bird species of the family Rallidae (Bent, 1926;
Bent (1926) studied the habitats of Virginia rail (*Rallus limicola*) and found that they preferred marshes dominated by cattails, graminoid marshes and bushy borders of wetlands along lakes, ponds or rivers.

According to Provost (1947) the breeding habitat of Yuma clapper rail (*Rallus longirostris*) consisted of freshwater reed marshes where tall emergent vegetation is interspersed with areas of open water and water depth is usually between 0.5-1m. Bohlen (1978) reported that they were found in marshes and ponds with emergent aquatic vegetation.

Warner and Dickerman, (1959) noted that King rails (*Rallus elegans*) were widely distributed in permanent fresh water marshes along some brackish wet lands in central Mexico. Meanly (1969) also reported the same type of habitat for this species in eastern U.S.

Lane (1962) reported that Yellow Rail (*Coturnicops noveboracensis*), a small rail measuring 7.25 inches in length, was found potentially in large marshes. This species prefers dense monotypic stands of sedges or grasses with shallow standing water. According to Northern Prairie Wildlife Research Centre (2003) breeding habitat of yellow rails consists of wet sedges (*Carex* spp.) meadows and other wetlands containing grasses, rushes (*Juncus* spp.) and bulrushes (*Scirpus* spp.). Gibbs et al. (1991) found that yellow rails probably occurred as migrants on their way to and from Canada in the wintering areas of California Coast.
Anderson (1965) found that the nests of the common moorhen were floating platforms near open water in cattails, bulrushes, sedges, horsetails, and reed grasses. Common moorhen preferred somewhat deeper water than rails, but lower water and denser vegetation than coots. Fergus (2001) reported the same type of nesting sites for common moorhen.

Fordham (1983) studied the dispersion and the activity of the pukeko (*Porphyrio.p.melanotus*) inhabiting the wet lowlands and swamps in New Zealand.

James (1985) noted that American coot (*Fulica americana*), common moorhen (*Gallinula chloropus*), Virginia rail (*Rallus limicola*) and king rail, (*Rallus elegans*) were the native rails of Ontario wetlands in United states.

According to Johnson and Dinsmore (1985) relatively little was known about the ecology of Virginia rails and soras (*Porzana carolina*) because of their secretive nature and the dense vegetation they inhabit. Bookhout and Stenzel (1987) noted that the breeding habitats of these birds consisted of wet sedge meadows and other wetlands containing grasses, rushes, and bulrushes.

In south of the United States, the clapper rails were found generally associated with tidal marshes. Anderson and Ohmart (1985) reported that the Yuma clapper rail (*Rallus longirostris yumanensis*) was unique among the clapper rails in being the only one that occupies fresh-water marshes during the breeding seasons.

According to Eddleman *et al.* (1988) despite the king rail’s broad geographical range in U.S., its populations have declined alarmingly throughout major portions of its range, owing mostly to the loss of wet lands.
Evens et al. (1991) studied the distribution of California black rails (*Laterallus jamaicensis coturniculus*) in the marshes of northern Bay region in California.

According to Eskell and Garnett (1979) the dusky moorhen (*Gallinula tenebrosa*), which was common in swamps and waterways in Australia had colorful bright orange frontal shields during the breeding season and possessing white under tail coverts.

Banded rail (*Rallus philippensis*) is found in a wide variety of habitats including grassland, scrub forests, mangroves, freshwater wetland and salt marsh within its range (Ripley, 1977). In New Zealand the banded rail is confined to freshwater wetlands, salt marshes and mangroves in the northern half of the North Island, and to salt marshes in Nelson and Marlborough in the South Island (Elliott, 1987).

The Corncrake (*Crex crex*) is a rail considered to be declining in numbers in most of its world range (Tucker & Health, 1994). As a result, this species is listed as being threatened with global extinction and is thus of high priority for conservation action (Collar et al. 1994; Groombridge, 1994).

Snow & Perrins (1998) observed that abundant population of coots bred on many suitable water bodies in the North African part of the Mediterranean area.

Peterson and Peterson (1990) studied the habitats of some rails and sora. According to them Virginia rail (*Rallus longirostris obsoletus*) prefers brackish marshes, black rail (*Rallus limicola*) fresh and brackish marshes and sora (*Porzana carolina*) fresh marshes, wet meadows and salt marshes.

According to Bunin and Jamieson (1995) Takahe
(Porphyrio mantelli) was a highly endangered species and susceptible to extinction.

Another species of Takahe, Porphyrio hochstetteri is a large, flightless rail endemic to New Zealand’s South Island, and the largest extant species of rail in the world. Lee and Jamieson (2001) described the drama of rediscovery of Takahe (which was considered extinct) and the following changes to New Zealand’s wildlife conservation consciousness, both institutionally and in a broader societal context.

In Kerala, Ali (1996) and Neelakantan (1986) reported that the white-breasted water hen, Amaurornis phoenicurus phoenicurus locally called ‘kulakkozy’ is the most familiar rail seen in the banks of rivers, ponds, paddy fields and even in town areas having swamps with marginal vegetation.

General habits of many species of Rallidae were reported by many authors (Gullion, 1952a; 1952b; 1953a; 1953b and 1954; Meanley, 1963; Craig 1977; Garnett, 1978 & 1980; Isted, 1978; Garnett, 1980; Ogle and Cheyne, 1981; Crawford et al. 1982; Elliot, 1987; Irwin & O’Halloran, 1977; Odin, 1988; Pollock and O’Halloran, 1995; Ryan et al., 1996; Robert and Laporte 1999).

While studying the breeding of American coot in Western California, Gullion (1952a; 1952b; 1953a; 1953b and 1954) reported some unique peculiarities in its breeding behaviour.

Pre-nesting activity of the purple gallinule (Porphyryula martinica) was reported by Meanley (1963) at the Savannah National Wildlife Refuge, Georgia.

Analyses of behaviour, breeding, and social organization of the pukeko (Porphyrio porphyrio melanotus) in relation to its habitat at Pukepuke Lagoon in New Zealand have been provided by Craig (1977).
Garnett (1980) found that dusky moorhens (*Gallinula tenebrosa*) common in swamps and waterways in Australia existed predominantly in free-ranging flocks and tend to form territorial groups of two to seven birds during breeding season. In a group one to three males per females were present and all males were found to copulate with all females. Such a pattern of behaviour also occurs in the black crake (*Porzana flavirostris*) (Schmitt, 1975) and the cape rail (*Rallus caerulescens*) (Schmitt, 1976).

Garnett (1978) and (1980) observed that like many other members of the Rallidae, dusky moorhens foraged on the ground and flicked their tail vertically, revealing their conspicuous under tail coverts. Ryan *et al* (1996) studied the ecological and behavioural role of scanning and tail-flicking in these birds.

Ogle and Cheyne (1981) have used successfully playing taped calls of spotless crakes (*Porzana tabuensis*) to determine their presence and to identify the habitat they use in New Zealand.

Crawford *et al.* (1982) reported that even though many of the rails in North America are non migratory, the endangered subspecies of the clapper rail, *Rallus longirostris yumanensis* migrated to long distance during breeding season.

Elliot (1987) reported that banded rails were primarily diurnal with a morning peak of activity and a lesser peak in the evening in summer.

In corncrakes Sheppard and Green (1994) found that the male advertised for mates and probably defended territory by a loud disyllabic song, which was produced occasionally by day and almost continuously at night from tall vegetation. Bookhout (1995) described vocalization of yellow rails (*Coturnicops noveboracensis*) by both sexes as a series of clicking noises, usually in a 5-note pattern, “click-
click-click-click-click”. Other calls of this bird may include a ten note descending cackle, with three or four notes that sound like distant knocking on a door, soft croaking or quiet wheezing or clucking notes (Sibley, 2000). Savaloja (1981) found that young chicks and juveniles of yellow rails give various sounds described as “wees” and “peeps”

Irwin and O’Halloran (1997) studied the activity pattern of a flock of coot, *Fulica atra* at Cork Lough, South West Island. According to Odin (1988) coots spent the majority of their day light hours on the water and the time spent out of the water was considerably lower, representing less than 6% and at this time the birds were grazing. This is in sharp contrast to the pattern seen for moorhen, which spends almost 70% of their time out of the water (Pollock and O’Halloran, 1995).

Robert and Laporte (1999) observed that a genuine molt migration in yellow rails (*Coturnicops noveboracensis*) along the St. Lawrence River, in southern Quebec which was similar to that known to occur in waterfowl and coots.

Many rails especially coots are vigilant against predators. Randler (2006) found that coot (*Fulica atra*) showed increased vigilance in response to the playbacks of dog barks and conspecific coot alarm calls and this increased in vigilance might have implications for conservation, especially when considering buffer zones around sensitive areas of the habitat.


For the information of species presence and richness of birds Weber and Theberge (1977), Reynolds *et al.* (1980), Verner (1985)
and Verner & Ritter (1985) recommended total counts. Ryan et al. (1991) opined that simple point counts were easy to conduct in the field and its data analysis was straight forward. According to them repeating surveys (15 surveys in 20 days for a year) could increase confirmation of seasonal presence or absence of many marsh bird species in a wetland.

According to Bibby et al (1992) no distance point count method of counting all birds seen or heard can be adopted for the census study of bird population in a limited area.

Population studies of different members of Rallidae were carried out by many authors (Penny & Diamond, 1971; Greise et al., 1980; Garrett and Dunn, 1981; Brackney and Bookhout, 1982; Ferreras and Macdonald, 1999 and Gibbs et al., 2003).

Penny & Diamond (1971) reported that the white-throated rail of Aldabra (Dryolimnas cuvieri aldabranus) was the last surviving flightless bird in the western Indian Ocean and their numbers were estimated to be approximately 1000 birds. Greise et al. (1980) studied the habitat densities of sora (Forzana carolina) in Colorado.

Garrett and Dunn (1981) studied the effect of draining and alteration of fresh-water marsh habitats on the population of the Yuma clapper rail and other rail species found in southern California. According to them the California clapper rails foraged in channel habitats and nest in native high marsh pickle weed (Salicornia virginica) and the gum plant (Grindelia stricta) lining the channel edge. Both of these plants may be displaced and altered by the introduced Spartina spp. resulting in the habitat loss for this rails.

Brackney and Bookhout (1982) studied the population size, distribution and habitat selection of common gallinules (Gallinula chloropus) in the south western Lake Erie Marshes.
Gibbs et al (2003) assessed current status or population trends of Galapagos rail (*Laerallus spilonotus*) which is endemic to the Galapagos Archipelago.

Ferreras and Macdonald (1999) observed that impact of predation by the American mink, *Mustela vison* in the upper Thames during the bird breeding season was very high for coots (30–51% of adults and 50–86% of broods) due to their unique nesting behaviour.

About one third species of the family Rallidae are presently threatened with extinction (Bennet and Owens, 1997) primarily due to the habitat destruction (King, 1981). Many authors have reported such a decline in the population of various species of Rallidae (Evens et al., 1991; Bunin and Jamieson, 1995; Green et al., 1997; Crockford et al., 1996; Eisermann, 2006).

Evens et al. (1991) reported that the population size of California black rails in the marshes of the northern Bay region in California has decreased low enough to cause concern and it has been listed as a State of California ‘Threatened Species’ and a ‘Federal Species of Management Concern’.

Declines in the population of the corncrake (*Crex crex*) have been reported from most states in the breeding range in Europe (Green et al., 1997). However, states in eastern Europe with lower intensity of agriculture tend to have larger populations and higher population densities than states in western Europe.

Since there has been no review of the conservation biology of the corncrake, in 1994 Bird Life International co-ordinated such a review as part of preparations for a ‘Species Action Plan’ to assist the recovery of European corncrake populations (Crockford et al., 1996).

In Guatemala among Rallidae the uniform crake
(Amaurolimnas concolor) is endangered while spotted rail (Paradirallus maculatus) is critically endangered (Eisermann, 2006).

According to Bunin and Jamieson (1995) despite protection and intensive management, including removal of an introduced competitor (red deer - Cervus elaphus), population of the Takahe (Porphyrio mantelli), has continued to decline in New Zealand. Takahe lacks appropriate behavioral responses to cope with mammalian predators such as stoats (Mustela erminea), which have been introduced recently by European colonists.

Food and feeding of many species of Rallidae were reported by various authors (Warner and Dickerman, 1959; Anderson, 1965; Carroll, 1966; Sprunt and Chamberlain, 1970; Mills, 1973; Fitzner and Schreckhise, 1979; Terres, 1980; Savaloja, 1981; Meanley, 1992; Marchant and Higgins, 1993).

Warner, and Dickerman (1959) reported that king rails fed in freshwater reed marshes, graminoid marshes and marshy borders of lakes, ponds and rivers and seemed to prefer relatively shallow water of 5-10 cm and areas with shrubs or the drier borders of wetlands. According to Meanley (1992) king rails are diurnal feeders typically forage in open water and cultivated fields adjacent to suitable wetland habitats and their diet consists of small crustaceans, aquatic insects, fish, frog, terrestrial insects and aquatic plant seeds.

Anderson (1965) found that the common moorhens would feed in stubble fields and pasture more than 1 km from their breeding territories in winter.

Carroll (1966) based on the examination of stomach contents and direct observation suggested that peaks of feeding occurred in pukeko (Porphyrio p. melanotus).
Sprunt and Chamberlain (1970) reported that the food of the common moorhen consisted of seeds, roots, soft parts of succulent water plants, snails, other small molluscs, grasshoppers, various other insects and worms. In this species, Bell and Cordes (1977) reported that 96.75% of diet was vegetable food comprising grass, rootlets and seeds and various weeds. Only 3.25% of the diet of this species constituted the animal matter comprising insects and small molluscs. However, it was noticed that no vegetable food was presented to the young and adult food habits were adopted only when they became independent.

In yellow rails, Savaloja (1981) noted that most of the feeding activity took place during the daytime and the birds have been seen with their heads 1.5 inches under the water while searching for food. According to Terres (1980) diet of this bird mainly included small snails, insects, seeds, grasses, and clover leaves.

Marchant and Higgins (1993) observed that the dusky moorhen fed on seeds and the tips of grasses and shrubs present in swamps and waterways. Mills (1973) indicated that in the large flightless takahe (Notornis mantelli) feeding occupied over 90% of the day (over 21 hours) with a fairly constant rate of feeding throughout.

Peculiarities in feeding behaviour of Tasmanian native hen (Tribonyx mortierii), weka (Gallirallus australis australis) and moorhen (Gallinula chloropus) were investigated by various authors in their habitats (Anderson, 1965; Falla et al., 1966 and Ridpath, 1972).

Fordham (1978) indexed the feeding intensity of moorhens (Gallinula chloropus) in Scotland by combining frequency of feeding activities with rate of pecking measured on three substrates.

While studying the breeding, Gullion (1954) found that the American coot fed only within their own territories. Fitzner and
Schreckhise (1979) noticed that they fed aquatic insects and vegetation to their semi precocial chicks in the marshy breeding grounds. Cramp and Simmons (1980) have the opinion that coots are omnivorous and feed mainly on the vegetative parts and seeds of aquatic and sometimes terrestrial plants.

Wong et al. (2000) reported that the differences in feeding behavior of wetland birds were mainly due to difference in prey composition and factors such as hydrological regime and degree of organic enrichment of wetland bodies.

Kushlan (1978) reported that many wetland birds built nest when the prey was more abundant and available during the rainy season in most tropical areas.

Nota (2003) studied the characteristics of foraging territoriality in the little egret (Egretta garzeta) and effects of body size and sex on territoriality. He categorized territoriality within the foraging area into three types according to the birds’ exclusiveness and attachment to the area: high exclusiveness and strong attachment to the same area for a long period, moderate exclusiveness and attachment and minimal exclusiveness and attachment.

Many species of the family Rallidae use wetlands as their breeding ground worldwide. Various authors have described the breeding habitats of different species of this family (Provost, 1947; Bennett and Ohmart, 1978; Sugden, 1979 and Sauer et al., 1996).

Provost (1947) reported that water depth was always less than 15 cm. in the breeding habitat of Virginia rails (Rallus limicola); however the same author reported that breeding territory of common
moorhen consisted of freshwater reed marshes where tall emergent vegetation was interspersed with areas of open water with 0.5-1m depth.

According to Sugden (1979) American coots built nest in freshwater marshes with permanent water where small patches to extensive areas of tall emergent vegetation are present. Sauer et al. (1996) described that all species of Rallidae - yellow rail, black rail, king rail, Virginia rail, sora, common moorhen and American coot found in North America showed the habitat preference to wetlands with substantial emergent vegetation and variable open waters.

Yuma clapper rail breeds in heavily-vegetated fresh-water marshes with cover ranging from moderately dense stands of *Typha domingensis* (cattail) and *Scirpus sp.* (bulrush) along the Colorado River to dense near monotypic stands of *Typha* (Bennett and Ohmart, 1978). According to Tourenq et al. (2004) habitat composition around nesting sites was one of the important factors that drive the colonial nesting in herons.

Some authors noted the breeding territory of a few rails (Provost, 1947; Meanley, 1963; Siegfried & Frost, 1975; Rabe, 2001). Provost (1947) found that the territory size of Virginia rail ranged from 0.25 to 1 hectare depending upon habitat quality. Meanley (1963) reported that a breeding territory of the purple gallinule (*Porphyrylula martinica*) on the alligator weed mats and lily pads was measured 61 meters in length and 30 meters in width and was vigorously defended against other species. Siegfried & Frost (1975) reported that common moorhens were territorial, but no estimates of the size of its territory were available. According to Cramp (1980) coots were highly
territorial and aggressive during the breeding season. Rabe (2001) reported that territory size of king rails appeared to be 0.3-0.5 hectare.

During nesting season many wetland birds show unique breeding behaviour. Rabe (2001) observed that king rails were quite vocal at night during the courtship and incubation period (Mid April to mid May) and readily responding to the tape recordings of their loud and diagnostic calls. Forman and Brain (2004) reported the reproductive behaviour of common moorhens colonising an artificial wetland habitat in South Wales.

Kato et al (2000) studied sexual and individual differences in foraging and parental behavior of king cormorants (Phalacrocorax albiventer) during the brood-rearing period at Macquarie Island and found that male and female king cormorants provisioned their chicks at similar rates despite large individual variation in foraging behavior.

Observations of Maheswaran and Rahmani (2001) indicated that in black necked storks (Ephippiorhynchus asiaticus) territoriality increased as food levels became depleted, resulting in increased rates of aggression towards intruders.

In South east Alabama, Folk and Hepp (2003) reported that wood ducks (Aix sponsa) showed a stronger relationships between habitat use and incubation behavior under environmental conditions that were more severe or less predictable. Cockburn (2006) reported that biparental care occured in 75% of the known species of wetland birds.

Reproductive period among birds is found to be well timed to
achieve better breeding success. Havlin (1970) and Brinkhof (1997) reported that seasonal and spatial habitat-specific variation in food abundance was known to affect both the timing of reproduction and breeding success in coots. Bennett and Ohmart (1978) reported that Yuma clapper rails bred from March to July. In Poland, Schaffer (1995) studied timing of breeding of corncrakes by finding the nests of radio tagged female and by estimating the age of captured chicks.

Nests of yellow rail, (*Coturnicops noveboracensis*) are clumps of dead sedges over water or sometimes on dry ground (Terrill, 1943). Gaines (2003) reported that nest placement differed based on habitat characteristics in clapper rail (*Rallus longirostris*) on the Georgia coast.

Sora (*Forzana carolina*) prefers to nest in tall, dense sedges adjacent to cattails which offer some escape cover. They will choose freshwater or brackish marshes of many types of swamps, beaver meadows and bogs (Lowther, 1977). Fredrickson (1971) observed that the nest of common moorhen was usually a shallow platform elevated slightly above water among robust emergents. All the nests of this bird were placed in shallower parts or around borders where water was not over 2 ft. and constructed with a sloping runway of rushes leading to the water. Males often built other nest-like platforms for brooding their young. According to Peterson (1980) common moorhens built nest in small colonies.

Bennett and Ohmart (1978) reported that Yuma clapper rails built nest on a platform of vegetation raised 7-15 cm above the ground and concealed in dense marsh vegetation.

Frith and Frith (1990) described for the first time the nests, eggs and chicks of the chestnut forest-rail, *Rallina rubra* from Tan Gap, Southern Highlands Province, Papua New Guinea and found
that the nest of this bird was a large globular or domed structure of moss, leaves and ferns with a side entrance, typically placed some 2 m high in a *Pandanus* palm crown.

Gaines *et al.* (2002) reported that nest placement of the clapper rail (*Rallus longirostris*) differed based on habitat characteristics but nest-structure morphometrics was similar and consistent in different habitats.

Studies on the clutch size of some species of Rallidae were reported by various authors (Gullion, 1954; Fredrickson, 1969; Bennett and Ohmart, 1978; Stowe & Hudson, 1991; Sandercock, 1996 and Schwarzbach *et al.*, 2006).

Gullion (1954) reported that the American coots lay an egg a day until the clutch is completed. Fredrickson (1969) conducted an experimental study on the clutch size of American coots.

According to Bennett and Ohmart (1978) Yuma clapper rail lays a remarkably variable number of eggs. The typical clutch size is 8-10 eggs, but clutches can range from 5-14 eggs.

Hill (1988) studied the effects of local resource abundance on the reproductive characteristics of American coots in Eastern Washington and found that clutch size did not vary systematically with resource abundance. Schwarzbach *et al.* (2006) reported that clutch size was 7 in clapper rails.

Studies of egg-laying by radio-tagged females of corncrakes Stowe & Hudson, (1991) showed that they usually laid one egg per day, but that eggs could also be laid at shorter intervals and the average clutch size was about 10 eggs. Sandercock (1996) found that the presence of an additional egg in the clutch of sandpipers had a
significant effect on the length of incubation, extending the duration by about one day.

Arnold (2002) found that in mallards (Anas platyrhynchos) body mass was positively correlated with egg production among continuous laying females.

Bennetts et al. (2000) evaluated the influence of environmental and density-dependent factors (intraspecific and interspecific) on clutch size, brood size, and nesting success of little egrets (Egretta garzetta) in the Camargue of southern France and found that clutch size was positively associated with rainfall and negatively associated with the number of nests.

Incubation of a number of species of Rallidae was noted by various authors (Gullion, 1954; Fredrickson, 1969 & 1970; Scott, 1978; Cramp, 1980; Hill, 1986; Stowe & Hudson, 1988 & 1991 and Tyler, 1996).

The incubation period of American coots ranges from 21 to 23 days. (Gullion, 1954; Fredrickson, 1970; Hill, 1986). According to Cramp (1980) incubation of these birds lasted for 21-24 days. The chicks of coots are known to be of different ages, suggesting the hatching of one egg per day in a clutch (Scott, 1978). Removal of eggs from nests after the clutch was completed and during the incubation period induced some coots to initiate a second laying cycle (Fredrickson, 1969). Stowe & Hudson (1991) noted that incubation of the first nest of corn crakes took about 18 days. Stowe & Hudson (1988) observed that in this bird the incubation began with the completion of the clutch and was carried out by the female only. According to Bent (1926) both sexes of common moorhen were found to incubate.
Some authors noted the brooding and reproductive cycle of a few species of Rallidae (Gullion, 1954; Meanley, 1969; Peterson and Peterson, 1990; Stowe & Hudson, 1988 and Tyler, 1996). Gullion (1954) studied the reproductive cycle of American coots in California. Meanley (1969) reported that one month old siblings of King rails of a given brood normally represented various stages of development since they did not hatch simultaneously and each was capable of quadrupling its weight during the first month of its life. Peterson and Peterson (1990) found that all chicks of chestnut forest-rail *Rallina rubra* were with black downy plumage. Stowe & Hudson (1988) observed that the chicks of corn crakes left the nest soon after hatching and were fed by the female bill-to-bill. It was also observed that in these birds foraging of broods took place within 100 - 200 m of the nest and partial losses of chicks occurred, almost all within the first 5 - 6 days after hatching.

According to Tyler (1996), in Scotland, an average of 41 % of first brood chicks of corn crakes remained alive at independence in the broods where at least one chick survived after fledging. Peterson (1980) noted that young ones of common moorhens were precocial and left the nest soon after hatching.

Breeding success rate is considered as an indicator of population trends of birds. Rizi (1999) found that hatching success of the coot, *Fulica atra* (the number of eggs hatched per clutch) of breeding on two lakes in Algeria was dependent on various factors such as laying date, egg volume and water depth at nesting sites but independent of clutch size. Different measures of reproductive success in coots were reported to be related to the timing of reproduction (Brinkhof *et al.*, 1997). Meanly and Wetherbee (1962) reported that in King rails improved nest success was observed in the nests placed in the interior dense marsh land vegetation.
Schwarzbach (2006) assessed the reproductive success of the California clapper rail (*Rallus longirostris obsoletus*), an endangered subspecies restricted to San Francisco Bay and found that predation on eggs and contamination by excess concentrations of mercury, barium and chromium were the major factors affecting nest success. Tyler (1996) observed that in spite of the destruction of nests of corn crakes by mowing in Scotland nest success was remarkably high – (93% of nests survived from laying to hatching).
References


