

CONTRIBUTION TO THE KNOWLEDGE OF THE DIET OF IRANIAN BIRDS

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Abstract. This article reviewed the diet of 37 species in systematic list, but not species with up to three specimens. The diet studies of birds were mainly conducted by stomach analysis in Iran most of them studied on one/two species, then gut contents survey, chick feeding observation, faecal analysis and dead birds, many direct/indirect observations, video camera recording of parents/nestlings feeding, and pellet analysis of birds of prey in the recent years. Methods with no killing any birds such as pellet, faeces and dead bird analyses are encouraged. We need more multi-disciplinary collaborations to develop the diet studies in the future.

Key words: Iran, ecology, feeding, diet.

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Об изучении питания иранских птиц. - А. Халеджизаде, М.С. Сеххатисабет. - Беркут. 15 (1-2). 2006. - Приводится обзор результатов изучения питания 37 видов птиц Ирана. Материал собирался в основном путем исследования содержимого желудков, а также обследования кишечника, наблюдения за кормлением птенцов и кормежкой взрослых птиц, анализа фекалий и мертвых птиц, погадок хищных птиц и т. п. В будущем для изучения питания птиц необходимо сотрудничество специалистов различного профиля.

Introduction

Since 1970s, diet studies of birds were mainly conducted by stomach analysis in Iran firstly with systematic survey of food items details for *Alectoris chukar* (Dayani, 1978; Fekri, 2003), then used for *Francolinus francolinus* (Rafiei, 1977), *Ammoperdix griseogularis* (Mahmoudi, 1988), *Turdus merula* (Balmaki, 2003), Paridae (Sehhatibet, 1999), *Parus major* (Sehhatibet et al., 2003) and *Galerida cristata* (Khaleghizadeh et al., 2005b). Other surveys were including gut contents survey (Mansoori, 1977), chick feeding observation (Barati, 2003), faecal analysis and dead birds (Amini-Tareh, 1999), many direct/indirect observations (Mobini, 1979; Dayani, 1985; Dayani, Baloutch, 1985; Hamedanian, 1997; Amini-Tareh, 1999; Khaleghizadeh 2004b), and video camera recording of parents/nestlings feeding (Sehhatibet et al., 2003).

Pellets of birds of prey were firstly used for identification of rodents in the north of Khorasan province (Darvish, 1991) and Torbat-e-Jam area only (Majdzadeh, 2000), but it is recently done on some species such as

Athene noctua (Obuch, Kristin, 2004), *Corvus frugilegus* (Khaleghizadeh, 2004a, 2006), *Buteo rufinus* (Khaleghizadeh et al., 2005a), *Falco tinnunculus* (Khaleghizadeh, Javidkar, 2006) and *Falco naumanni* (Khaleghizadeh, Javidkar, in press).

The diet of 37 species is reviewed in systematic list. Most of the studies were on one/two species, but a wide range of waterbird species were gotten from Lake Amirkelayeh (Ghonouei-Rastegar, 1997), and in northern and southern coasts of Iran (Behrouzi-Rad, 1992). Species with up to three specimens are omitted in this article.

Systematic List

Great Grebe (*Podiceps cristatus*). In Gilan, ten birds comprised of 5 % snails and 95 % fishes. Fishes were including Carp (42 %), Bleak (20 %), Kilka (15 %), Mullet (11 %) and Caspian Roach (10 %) (Behrouzi-Rad, 1992).

Red-necked Grebe (*P. grisegena*). Twenty-four birds in northern Iran included plant materials (98 %) and snails (2 %) (Behrouzi-Rad, 1992).



Great Cormorant (*Phalacrocorax carbo*). Of 160 birds in Gilan, fishes (100 % of total contents) were Carp (97 %) and Grass Carp (2 %). In Mazandaran, fishes (100 % of total contents) were of Carp (20 %) and Mullet (80 %) (Behrouzi-Rad, 1992). Survey on the diet of Great Cormorants chicks using regurgitates showed that the main species in its diet belong to Mugilidae, Gobidae, Atherinidae and Clupeidae, c. 90 % were from Mugilidae, Gobidae, while from early April to the end of May increase in the percentage of Gobiidae, and decrease in Mulgidae (Barati, 2003). 115 stomachs throughout May to June around Caspian Sea coastline in 126 days in breeding season with population about 24500 cormorants (adults and young) they catch 2000 tons fishes (1280 tons *Mesogobius*, 340 tons *Caspialosa*, 180 tons *Neogobius*, 100 tons *Clupeonella delicatula*, 80 tons *Atherina*, and 20 tons other fishes) (Monavari, 1988).

Pygmy Cormorant (*Ph. pygmeus*). In Gilan, fishes (100 % of total contents) were Carp (33 %), Caspian Roach (6 %), Bleak (3 %), and other fishes (58 %), also shrimps (Behrouzi-Rad, 1992).

Mallard (*Anas platyrhynchos*). Gizzard contents of five birds were including grains, plant materials, insect eggs and grits (Ghounouei-Rastegar, 1997).

Goosander (*Mergus merganser*). Four birds in Mazandaran, ate fishes (100 % of total contents) of Carp (20 %) and Mullet (80 %) (Behrouzi-Rad, 1992).

Long-legged Buzzard (*Buteo rufinus*). The prey items found in Long-legged Buzzard pellets were mammals, birds and turtles that were available in 61.5 %, 11.7 % and 5.9 % of these pellets, respectively. Identified mammal items in samples included Hares, *Lepus* sp., *Meriones* sp., *Gerbilus* sp. and Erinaceidae. Also, the remains of a specimen of *Columba livia* was observed (Khaleghizadeh et al., 2005a).

Common Kestrel (*Falco tinnunculus*). A batch of 104 pellets from Tehran in breeding season in 2003 revealed the following items: small mammals (58.8 %, including *Mus* sp. cf.

M. musculus 11.7 %) and birds (51.0 %, including *Passer* cf. *P. domesticus* 11.7 %) before hatching of offspring, but reptiles (44.4 %), Vertebrata cf. Reptilia (13.0 %), insects (all items 61.1 %), Coleoptera (29.6 %, including Green Beetles 16.6 %), Orthoptera (42.6 %), Formicidae (1.8 %) and snails (*Helicella candeharica*, 1.8 %) after hatching of offspring (Khaleghizadeh, Javidkar, 2006).

Lesser Kestrel (*F. naumanni*). Of 239 pellets, Rodentia were contained among 18.8 % of the pellets. *Meriones* sp. (49 %) was the most important item among Rodentia (Khaleghizadeh, Javidkar in press).

Chukar (*Alectoris chukar*). Of twenty specimens from Azgi, Central Alborz, 40 different plant species were identified. Among them, *Salsola kali* and *Poa bulbosa* were dominant in the crop contents (45 %) followed by *Salsola vermiculata* (30 %). Other plant species were including *Artemisia herba-alba*, *Berberis vulgaris*, *Ficus carica*, *Noea mucronata*, *Ornithogalum ombelatum*, *Phaseolus vulgaris*, *Resedea lutea*, *Sorghum halepense*, and *Thlapspi arvense* but the genus were including *Adonis*, *Actinolema*, *Atriplex*, *Astragalus*, *Bongardia*, *Bromus*, *Bomium*, *Crataegus*, *Danthonia*, *Echinophora*, *Hetheramelium*, *Hulthemia*, *Haplophillum*, *Kochia*, *Lathyrus*, *Mespilus*, *Pulicaria*, *Panicum*, *Bromus*, *Stipa*, *Stachys*, *Setaria* and *Turgenia*. The grass was supplemented by a wide range of weed seeds, leave, berries, and insects. The Chukar also feeds on cereal grains-barley, wheat (Dayani, 1977). In another crop analysis in Esfahan province, of 26 chukars from Dashtak area, *Ranunculus ficaria* was dominant plant material (54 % of crop numbers) followed by *Astragalus* sp. (50 %) and *Poa bulbosa* (42 %). Considering the weight, *Ranunculus ficaria*, *R. aucheri* and *Daphne mucronata* were dominant plants over 0.5 g. Other plant materials were including *Allium* sp., *Biebresteinia multifida*, *Geranium tuberosum*, *Gagea chlorantha*, *Muscaria neglectum* and *Tulipa turkestanica*. Other materials were including grits (42 %), Formicidae (19 %) and insect eggs (4 %) (Fekri, 2004).



See-see Partridge (*Ammoperdix griseogularis*). Thirty-five birds collected from Gachsaran and Kuhkhiz, Dehdasht, Kohgiluyeh and Boyer-Ahmad province in summer 1987 contained *Stipa-Capesian* (88.6 %), *Salvia* (80.0 %), *Bromus-Tectorum* (51.4 %), *Hordeum* (22.8 %), *Medicago* (11.4 %) and *Triticum* (5.7 %) (Mahmoudi, 1988).

Black Francolin (*Francolinus francolinus*). A survey of diet was conducted to determine the differences of the diet between two groups of each sex and age using 78 birds in Dez and Karkheh regions, Khusestan province, southwest Iran. The diet was consisted of *Triticum vulgare*, *Hordeum* sp., *Avena* sp., *Carthamus oxyacantha*, *C. glaucus*, *Cirsium* sp., *Carduus* sp., *Alhagi camelorum*, *Polygonum persica*, *Lagonychium farctum*, *Capparis spinosa*, *Lycium* sp., *Vitex* sp., *Citrullus vulgaris*, *Sesamum indicum*, *Salvia* sp., Orthoptera, Hymenoptera, Coleoptera, Lepidoptera, Diptera, Odonata, Hemiptera, Chilopoda, Arachnida, Odonata, Gastropoda and grits. Major food items consumed by all birds were wheat seeds and ants. Male and female adults and juvenile females consumed seeds of the family Compositae, while adult and juvenile males consumed barley seeds (Rafiei, 1977).

Great Bustard (*Otis tarda*). Great Bustards were observed feeding in crops such as wheat, barley, alfalfa, pea and lentil. The crop contained some semi-digested grains of wheat and pea, as well as leaves of clover, alfalfa, and insects from the orders Coleoptera (including some species of Chrysomelidae) and Orthoptera. In summer, mainly in the breeding season, food consisted of terrestrial insects and insect larvae, especially grasshoppers, field-cricket, mole-cricket and beetles. Mice and lizards were also taken during field observations (Amini-Tareh, 1999).

Eurasian Woodcock (*Scolopax rusticola*). Gut contents of 16 shot woodcock showed that 37.5 % included fragmented remains of insects, 6.25 % for both Myriapoda and Gastropoda (*Limnea* sp.) and many seeds (Man-soori, 1977).

Black-headed Gull (*Larus ridibundus*).

Twenty-five birds in northern Iran, included plant materials, fish, and rubbish (Behrouzi-Rad, 1992).

Pallas's Gull (*L. ichthyaetus*). Fifteen birds in northern Iran, included fish bones and rubbish (Behrouzi-Rad, 1992).

Slender-billed Gull (*L. genei*). Six birds in Gilan, included some meat, rice, pea and bean (Behrouzi-Rad, 1992).

Little Gull (*L. minutus*). One adult and five immature from Anzali, contained Kilka and other fish bones (Mirzajani, 1996). Ten birds in Gilan included insects (90 %) and animals (Behrouzi-Rad, 1992).

Sooty Gull (*L. hemprichii*). Ten birds, ate of insects (65 %), Carp (14 %) and frog (21 %) (Behrouzi-Rad, 1992).

Common Gull (*L. canus*). Twenty birds in northern Iran, contained plant materials, insects, snails and other animals (Behrouzi-Rad, 1992).

Little Tern (*Sterna albifrons*). Of a total of 62 birds in Northern Iran, all of 46 % fishes were Carp (100 %) (Behrouzi-Rad, 1992).

Common Tern (*S. hirundo*). Of five birds in Gilan, all of 100 % fishes were Carp (100 %) (Behrouzi-Rad, 1992).

Caspian Tern (*Sterna caspia*). Of five birds in Miankaleh, all of 100 % fishes were Carp (Behrouzi-Rad, 1992).

Gull-billed Tern (*S. nilotica*). Of five birds in Gilan, all of 100 % fishes were Carp (100 %) (Behrouzi-Rad, 1992).

Whiskered Tern (*Chlidonias hybrida*). Fifteen birds in Anzali wetland ate from frogs, and from 95 % fishes (Carp 92.65 % and Caspian Roach 7.35 %) (Behrouzi-Rad, 1992).

White-winged Tern (*Chlidonias leucopterus*). Twelve birds ate from insects (77 %), carp (11 %) and amphibia (14 %) (Behrouzi-Rad, 1992).

Alexandrine Parakeet (*Psittacula eupatoria*). The Alexandrine Parakeet was found feeding on Quince (Golden apple) fruits (*Cydonia oblonga*), Pear fruit (*Pyrus communis*), Kaki (*Diospyros kaki*), Cypress cones (*Cupressus sempervirens*), Elm (*Ulmus carpini-folia*), Plane cones (*Platanus orientalis*) and



Pine cones (*Pinus eldarica*). 59–78 % of pine cones were cut by the Alexandrine Parakeet (Khaleghizadeh, 2004).

Little Owl (*Athene noctua*). Altogether 1924 prey items (from 17 sampling sites) belonged to two classes, 10 orders, 28 families, 75 genera and about 135 species of invertebrates. The proportion of mammals was 13.4% – 24 species. Birds (4.9 %) were represented by 18 taxa, reptiles were abundant, with Gekkonidae (3.6 %), Lacertidae (3.0 %) and Agamididae (1.5 %). In addition to dominant tenebrionids (17.2 %), and an unexpectedly high proportion of sunspiders (11.4 %), primarily species belong to the family Solpugidae. Also abundant were ants of the family Myrmicidae (9.2 %), large species (>33 mm) of earwigs (Dermaptera 6.5 %) and Scarabeids (4.9 %). Four samples contained fairly abundant Orthoptera (10.8 %) and Hymenoptera (11.6 %), three samples Coleoptera (31.2 %) and Solifugae (11.5 %). Of mammals there were abundant *Cricetulus migratorius* and *Mus* cf. *abbotti*, in the Mesopotamian lowlands the second being replaced by the taxon *Mus* sp. In deserts there were abundant Gerbil (*Gerbillus nanus*), Jirds (*Meriones libycus* and *M. crassus*) and Jerboa (*Allactaga elater*). Of larger mammals (> 200 g), the pellets contained Pika (*Ochotona rufescens*), Bandicoot Rat (*Nesokia indica*) and Indian Gerbil (*Tatera indica*). *Passer domesticus* (2.0 %) was the most abundant bird recorded. Other animal items were including *Jaculus jaculus*, *Meriones persicus*, *Suncus etruscus*, *Crociodura suaveolens*, *Galerida cristata*, Alaudidae, Hymenoptera, *Pipistrellus pipistrellus*, Scorpionidea, Dermaptera, Gekkonidae and Araneidea (Obuch, Kristin 2004).

Crested Lark (*Galerida cristata*). 30 plant species from 11 families were identified. Graminae and Amaranthaceae were the two most abundant families in terms of frequency of seed items (37.5 % and 23.5 %, respectively). The most frequent species was *Amaranthus retroflexus* (18 % of seed numbers), but *Triticum* sp. was taken by most birds (30.2 % of gizzards). Other plants material were including *Amaranthus chlorostachys*, *A. retroflexus*,

Anchusa sp., *Asperugo procumbens*, *Lithospermum arvense*, *Agrostemma githago*, *Spergularia* sp., *Vaccaria oxyodonta*, *Kochia scoparia*, *Carduus arabicus*, *Centaurea* sp., *Fumaria vaillantii*, *Echinochloa crus-galli*, *Hordeum* sp., *Panicum repens*, *Panicum* sp., *Setaria glauca*, *Setaria* sp., *Setaria viridis*, *Sorghum halepense*, *Triticum* sp., *Salvia* sp. or *Stachys* sp., *Allium* sp., *Polygonum aviculare* and *Rumex* sp. The remains of 4 species of insects were also found in 23 % of the stomachs. Formicidae contributed 18.6 %, and Orthoptera and Coleoptera 2.3 % each. Acrididae and the species *Messor caudus*, *M. muticus* and *Entomoscelinus adonis* were also in the Crested Lark's diet (Khaleghizadeh et al., 2005b).

Greater Hoopoe-Lark (*Alaemon alaudipes*). The species was eating 85 % insects, 10 % seeds (especially saline plants) and 5 % soft plants materials, also some lizards (Dayani, 1985).

Blackbird (*Turdus merula*). Diet of the species in autumn and winter was mainly fruits and forest seeds, also insects and snails, in Noor Plain Forests. For females (of 17 birds), c. 75 % was for plant materials and 20 % for animal items, but for males (of 32 birds) 79.3 % for plant items and 16.8 % for animal items. Plant identified items were *Crataegus monogyna*, *C. ambigua*, *Cydonia oblonga*, *Mesopilus germanica*, *Rubus persicus*, *Convolvulus* sp., *Cotoneaster multiflora*, *Hedera pastuchowii*. Animal items were including *Manta religiosa*, *Forficula auricularia*, *Scapteriscus didactylus*, *Magacicada septemdecim*, *Gulus virgatus*, *Lumbricus* sp., *Atalopedes campestris*, *Valvata piscinalis*, *Viterinus* sp. (Balmaki, 2004).

Great Tit (*Parus major*). Mesogastropoda: *Valvata piscinalis*, Gastropoda; Araneae: Cribellatae, Ecribellatae, Theridiidae, Lyniphiidae, *Araneus angulatus*, *Clubiona* sp.; Orthoptera: Tettigoniidae; Psocoptera, Hemipteroidea: Hemiptera, Tingidae, Homoptera, Psyllidae, Aphididae, *Rhopalosiphum padi*, *Myzus persicae*, Drepanosiphidae: *Therioaphis* sp.; Thysanoptera, Coleoptera: Staphylinidae,



Cucujidae: *Oryzaephilus surinamensis*, Alleculidae: *Omophlus* sp., Curculionidae, Scolytidae; Diptera: Brachycera, Syrphidae, Nematocera: Psychodidae; Lepidoptera: Tortricidae, Pyralidae: *Chilo suppressalis*, Geometridae, Sphingidae, Noctuidae, Noctuidae: *Agrotis* sp., Hadeninae: *Mamestra oleracea*, Heliothinae: *Heliothis* sp., Plusiinae; Hymenoptera: Tenthredinidae, Dolerinae, Vespidae: *Vespula* sp., Formicidae: *Formica* sp., *Lasius* sp., *Messor* sp., *Tetramorium* sp. (Sehhatiasabet, 2000).

Coal Tit (*P. ater*). Araneae: Ecribellatae, Theridiidae; Orthoptera: Tettigoniidae; Psocoptera, Hemipteroidea: Hemiptera, Tingidae, Aphididae; Coleoptera: Staphylinidae, Curculionidae; Diptera, Lepidoptera, Hymenoptera, Dolerinae: *Dolerus* sp., Myrmicinae: *Messor* sp., *Tetramorium* sp. (Sehhatiasabet, 1999).

Blue Tit (*P. caeruleus*). Mesogastropoda: *Valvata piscinalis*; Araneae: Cribellatae; Collembola, Orthoptera: Tettigoniidae, Hemipteroidea: Hemiptera, Tingidae, Sternorrhyncha, Psylloidea, Psyllidae, Aphididae, Drepanosiphidae: *Therioaphis* sp., *Chaitophorus* sp.; Coleoptera: Curculionidae; Diptera: Brachycera, Syrphidae, Nematocera: Psychodidae; Lepidoptera: Noctuidae, Plusiinae; Hymenoptera: Tenthredinidae: Dolerinae, Pteromalidae, Chalcididae, Formicinae, Myrmicinae (Sehhatiasabet, 1999).

Spanish Sparrow (*Passer hispaniolensis*). On ripening wheat at Dezfoul and Dashed-Moghan and on sunflower in Ali-Abad, grain seeds in post-harvest farms were up to 75 % of crop contents. If grains were not access, then they were eating on weed seed and bringing up nestlings feeding on insects (Mobini, 1979).

Pleske's Ground-Jay (*Podoces pleskei*). Diet comprised 75 % Coleoptera insects, 20 % seeds (especially wheat and pea), and 5 % soft plants materials. Also some lizards. Feeding on injured birds scarcely (Dayani, Balouch, 1985). Grains of wheat, barley, *Zygophyllum*, melon seeds, beetle parts and small lizards bones. Most insects were belong to the family Curculinidae. Wood termite stem and roots of *Zygophyllum* sp. and *Haloxylon* sp. were other items (Hamedanian, 1997).

Rook (*Corvus frugilegus*). Wheat (*Triticum aestivum*) and barley (*Hordeum vulgare*) seed coats, Ant (Formicidae) remains and grits were found in 45 %, 57 %, 66 % and 84 % of the pellets, respectively (Khaleghizadeh, 2004a). In another study, they contained plum (21.6 %), cherry (15 %), black cherry (4 %), unidentified stone of fruits (15 %), watermelon seeds (4 %), melon seeds (8.1 %), wild wheat seeds (21.6 %), weed seeds (16.2 %), remains of Coleoptera (12.1 %), Orthoptera (9.4 %), egg shelve of birds or reptilian (6.7 %) and grits (25.6 %) (Khaleghizadeh, 2006).

Discussion

The examination of the diet has been challenging in many ways. Examination called for skills in a variety of specialisms including entomologist, mammalogist, rodentologist, herpetologist, botanist, etc. skills, and experience of identifying their remains. Not many individuals are equipped to undertake such wide-ranging and detailed examinations, which might go to explain why there is so little published information describing diet studies in Iran. It is hoped that the review goes some way towards encouraging others (or small groups of individuals) to undertake further analyses. Methods with no killing any birds such as pellet, faeces and dead bird analysis are encouraged in the future. Multiple studies are also very much necessary (e.g. Mirzajani, 1996). For example, parasite, blood, genetic, bone, pesticides analyses are possible together with during crop analysis, only with calling their specialists. Therefore, we need more multidisciplinary collaborations to develop the diet studies in the future.

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Raptor Research Foundation's 5th Eurasian Conference will be held in Batumi, Republic of Georgia, from October 9th to 13th 2007. Organizers of the conference: the Raptor Research Foundation, the Georgian Center for the Conservation of Wildlife (GCCW) and the Directorate for Environment and Natural Resources of Adjara (DENRA).

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