

large in all races and mainly individual or due to age differences; juveniles average paler below than *ispida*, in particular *bengalensis* cream or white from chin to vent and often with extensive and contrasting blue-grey tinge on chest and breast, forming more or less complete band. Bill of *ispida* slightly heavier than in nominate *atthis* and *bengalensis*, both upper and lower mandible slightly more bulging towards tip, culmen especially; base and middle of bill appear deeper, but difference sometimes hard to see. Nominative *atthis* from European USSR, Rumania, Yugoslavia, Bulgaria, and Greece have wing shorter than in *ispida* (almost always 76 or less; in *ispida*, 76.5 and over) and bill on average longer (but much variation). Populations from southern Spain, north-west Africa, Corsica, Sardinia, southern Italy, and probably Dalmatia agree with typical nominate *atthis* from Middle East in slender bill; however, both wing and bill decidedly longer (in particular, little overlap in wing), but differentiation not marked enough to warrant recognition of separate west Mediterranean race. Position of populations inhabiting southern Soviet Central Asia, Afghanistan, and Kashmir problematical; here included in nominate *atthis* following Vaurie (1965), though wing slightly and bill apparently distinctly shorter (bill to nostril as low as 28 in some adults examined), underparts

on average paler, and chest and breast of juvenile more extensively blue; sometimes separated as *pallasii* Reichenbach, 1851 (see also Tschusi zu Schmidhoffen 1904, Johansen 1955, Ali and Ripley 1970). Birds inseparable from '*pallasii*' or *bengalensis* occur in Iraq and Arabia in winter. *A. a. bengalensis* poorly differentiated from nominate *atthis* from Middle East or from '*pallasii*'; upperparts on average slightly brighter blue (but extensive overlap in colour), adult ♀ apparently often has completely pale lower mandible, juveniles on average whiter below with extensively blue breast; slightly smaller in size, in particular in populations from northern India, south-east Asia, and China, but larger again towards north, with populations of Japan and perhaps south-east Siberia similar in size to those of Middle East. Other extralimital races differ in small size and generally much darker blue or violet-blue upperparts; Australasian races have ear-coverts partly or fully blue instead of rufous.

Forms superspecies with Half-collared Kingfisher *A. semitorquata* of Afrotropics, which differs only in slightly smaller size, blue ear-coverts, and (in both sexes) black bill. Blyth's Kingfisher *A. hercules* from northern India and south-east Asia perhaps also rather closely related, but breeding range overlaps widely with *A. atthis bengalensis* (Snow 1978; Fry 1980). CSR

Subfamily CERYLINAE pied kingfishers and allies

Very small to large kingfishers, frequenting waterside habitats. 9 species in 2 genera: (1) *Ceryle* (pied kingfishers, 5 species; Asia, Africa, the Americas); (2) *Chloroceryle* (green kingfishers, 4 species; tropical and subtropical America). Represented in west Palearctic by 2 species of *Ceryle*, 1 breeding, 1 accidental. Fry (1980) recognized 3 genera, including only Pied Kingfisher *C. rudis* in *Ceryle* and assigning remaining 4 species to *Megaceryle*, while retaining *Chloroceryle* as constituted here.

For general features, moults, etc., see Alcedinidae. Pro always longer than p4 except in some individuals of Pygmy

Kingfisher *Chloroceryle aenea*. Tails rather long, always more than half wing length. Bills strongly compressed laterally, culmen narrow, not depressed basally. Skull narrow. Lower end of tibio-tarsus unfeathered for some distance, tarso-metatarsus short or very short, no longer than inner toe without claw. Toes short or very short, but inner relatively longer than in other subfamilies, equal to or longer than outer.

Sexes differ in colour of underparts only. Primaries usually barred or spotted with white. Bills dark.

Ceryle rudis Pied Kingfisher

PLATES 66 and 68
[between pages 686 and 687]

Du. Bonte IJsvogel Fr. Alcyon pie GE. Graufischer
Ru. Малый пегий зимородок SP. Martín pescador pío

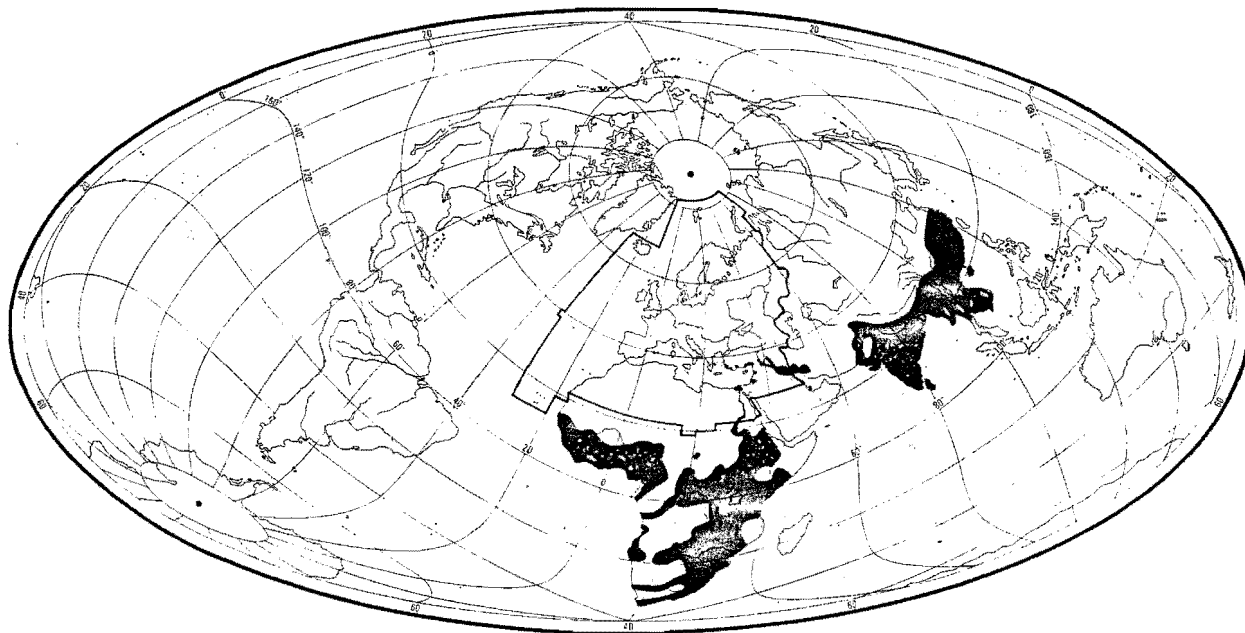
Sw. Gråfiskare

Alcedo rudis Linnaeus, 1758

Polytypic. Nominative *rudis* (Linnaeus, 1758), Middle East, Egypt, and Afrotropics. Extralimital: *leucomelanura* Reichenbach, 1851, eastern Afghanistan and western Pakistan east to southern China, south to southern Burma and Ceylon, except south-west India; *travancorensis* Whistler and Kinnear, 1935, Kerala to Cape Comorin (south-west India).

Field characters. 24–26 cm; wing-span 45–47 cm; bill c. 6 cm. Medium-sized to large kingfisher, with long black bill, pied black and white plumage, noticeable crest, and rather long tail. Flight agile but action more flapping than most kingfishers; hovers persistently. Restricted to open-water habitats. Sexes dissimilar; no seasonal variation. Juvenile separable at close range.

ADULT MALE. Long, black, dagger-shaped bill. Plumage predominantly black above and white below, with most obvious marks white supercilium contrasting with white-streaked black crown and black cheeks, 1 broad and 1 narrow black band across chest, bold black and white barring across back and wings, and white-barred black tail. In flight, white-bases to flight-feathers create striking panel.



Legs black. ADULT FEMALE. As ♂, but lower chest-band absent, and upper restricted to broad black side-patches, usually totally separated. JUVENILE. Resembles ♀ but chest-marks grey, not black, and usually joined across chest; throat feathers fringed grey.

Unmistakable. Flight freer and looser than Kingfisher *Alcedo atthis*, with wing-beats noticeably more flapping; hunts fish mostly by hovering followed by powerful plunge. Often conspicuous, perching in the open and forming small noisy parties. Flicks tail frequently.

Vocabulary includes a sharp, penetrating disyllabic 'quick-ick' and a vibrating whistle.

Habitat. From lower middle latitudes of west Palearctic, in Mediterranean and desert zones through subtropical to tropical regions. In Iraq, breeds near rivers, canals, and marshes (Allouse 1953) and in Israel widespread where suitable water (S Cramp). In Egypt, fishes along all water-courses, and even on coast (Etchécopar and Hüe 1967). In West Africa, frequent on coasts, even preferring tidal waters and sometimes fishing in surf, hawking over waves, or inhabiting mangrove belts (Bannerman 1933). In Sierra Leone, favours coast, where muddy and mangrove-lined, and tidal reaches of rivers; also lakes (G D Field). Numerous in lagoons and creeks in southern Nigeria, sitting on posts, and in Mali, at ponds in interior, fishing in wet season on tiny pools and in roadside ditches (Bannerman 1951). Also other habitats offering fish, such as marshes or ricefields (Serle *et al.* 1977). In southern Africa, on dams, lagoons, and seashore, fishing just beyond breakers (Prozesky 1970). In India, from sea-level to c. 1800 m, on every kind of standing fresh water, such as canals, pools, irrigation reservoirs, village tanks, and flooded ditches, and

also sluggish rivers and streams; apparently only occasionally on tidal creeks and on intertidal rock pools on sea-shore (Ali and Ripley 1970). As a breeding species, largely confined to banks of rivers, although found in plains wherever there is water, except in midst of forest (Whistler 1941). In Cyprus, watched in winter frequenting harbour and neighbouring coast, but sometimes shifting inland to fresh waters, even roadside ditch, or sitting on telegraph wire (Bannerman and Bannerman 1971). Forages in lower air-space, especially by hovering over water.

Distribution. LEBANON. Still breeding at Anjar (Tohmé and Neuschwander 1974). EGYPT. Faiyum: common in 1957 (Horváth 1959) but no recent observations there (PLM, WCM).

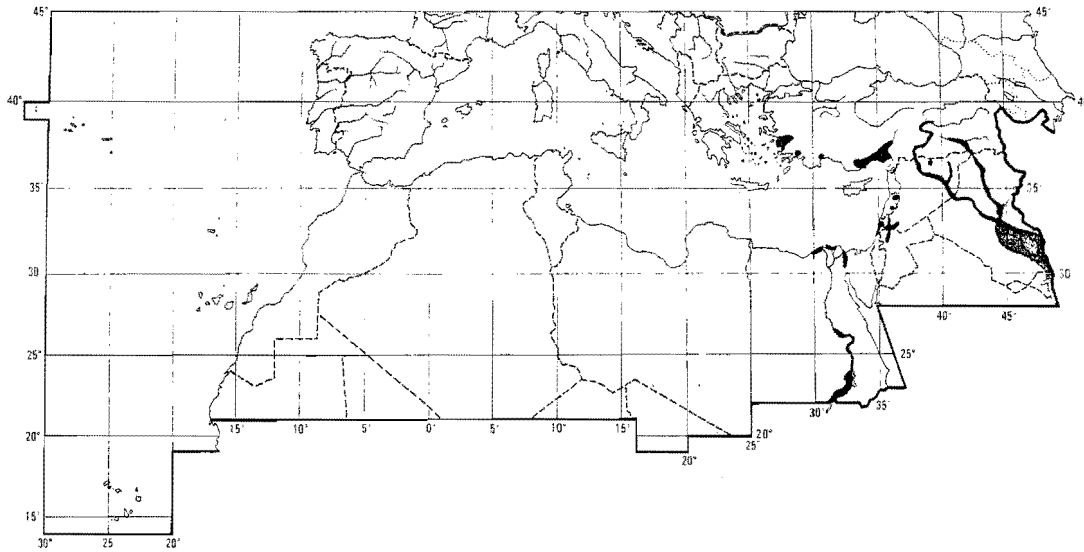
Accidental. Poland, Greece, USSR, Cyprus.

Population. TURKEY. Rather local but not uncommon (Beaman *et al.* 1975); numbers unknown, possibly 200 pairs (Parslow and Everett 1981). IRAQ. Very common Fao to Mosul (Ticehurst *et al.* 1922). LEBANON. Almost disappeared (Tohmé and Neuschwander 1974). SYRIA. Not rare in north (Kumerloève 1968b); apparent decrease since 1940s with only 2 records in breeding season 1975–7 (Macfarlane 1978). ISRAEL. Decreased considerably (HM). EGYPT. Common, but major decrease some areas, e.g. environs of Cairo and Giza (PLM, WCM).

Survival. East Africa: in ♂, 1st-year mortality 51%; average annual adult mortality 45% in ♂, 54% in ♀; oldest ringed bird at least 5 years (H-U Reyer).

Movements. Resident and to some extent dispersive.

Somewhat more widespread in Turkey in winter (Vit-



tery *et al.* 1972; Beaman *et al.* 1975), and Turkish birds (presumably) occur as rare and irregular winter visitors to Cyprus, October–April (Stewart and Christensen 1971). In Lebanon, known mainly as autumn and winter visitor to coasts, estuaries, and rivers (Benson 1970). In Iraq and south-west Iran, birds make local movements with season and river height (Moore and Boswell 1956); some disperse southwards for longer distances to become scarce visitors, mainly October to early April, to Kuwait and (more rarely) Persian Gulf coast as far as United Arab Emirates (Bundy and Warr 1980; Jennings 1981a). No well-defined movements in Africa either, though seasonal fluctuations of numbers in some places show that dispersals occur (e.g. Douthwaite 1973, Elgood 1982). One ringing movement of 760 km from Ethiopia to Uganda (Britton 1980).

Food. Principally fish, occasionally crustaceans, frogs, and aquatic insects. Dives for prey—either after hovering or from perch, e.g. tree branch or boulder. Flies parallel to shore, swooping up intermittently to hover at 2–10 m. On detecting prey, may drop in stages before diving (Whitfield and Blaber 1978). Fish held at right angles to bill and gripped behind gill covers. Small fish may be swallowed in flight; larger prey carried to perch, battered, shaken, and crushed dorso-ventrally before being swallowed head-first. Degree of battering appears to be linked to stoutness of fish, e.g. more hits given to *Tilapia zillii* weight for weight than to slimmer *Hemihaplochromis multicolor*. At Lake Victoria, only fish longer than 55 mm battered before consumption (Douthwaite 1971b). In South Africa, seen to beat small crab against rock (Cooper 1981). Recorded catching 2 *Pranesus pinguis* in one dive from above (Whitfield 1978). Usually feeds within 50 m of shore, needing to return to perch to ingest large prey. Exceptionally feeds up to c. 3.2 km from shore (Junor 1972). 4–5 peaks in fish-

ing activity per day, including peak up to dusk (Tjornlid 1973). Never fishes in heavy rain (Douthwaite 1976). Recorded perching on and diving from hippopotamus *Hippopotamus amphibius* (Pitman 1961; Pooley 1967). Recorded hovering above clawless otter *Aonyx capensis*, possibly to observe disturbed prey (Boshoff 1978). Insects, especially winged termites (Isoptera), taken in aerial pursuit; other termites taken from ground (Douthwaite 1976; Every 1976).

In Africa, fish include Cichlidae (*Tilapia zillii*, *Hemihaplochromis multicolor*, *Sarotherodon mossambicus*), silversides *Pranesus pinguis*, glassies *Ambassis*, mullets (Mugilidae), thornfish *Terapon jarbua*, sardine *Limnothrissa miodon*, round herrings *Gilchristella*, and halfbeaks *Hyporhamphus*; also *Barbus*, *Alestes*, *Nannocharax*, and *Aplocheilichthys*. In India, fish include Cyprinidae (*Puntius*, *Chela*) and Bagridae (*Mystus*); also Mugilidae (*Rhinomugil*, *Mugil*), Sciaenidae (*Pseudosciaenia*, *Johnius*, *Pama*), *Ambassis*, *Polynemus*, *Oryzias*, and *Harpodon*. Crustaceans (all areas) include *Macrobrachium*, *Palaemon*, *Cardina*, and *Metapenaeus*. Insects include larvae of dragonflies (Odonata), water-beetles (Dytiscidae, Gyrinidae), water-scorpions (Nepidae), water-bugs (*Belostoma*, *Notonecta*, *Corixa*), and termites (Isoptera). Also small frogs (Anura). Gastropod molluscs *Bellamya* and bivalve *Corbicula* recorded in stomachs but perhaps secondarily ingested. (Dementiev and Gladkov 1951a; Douthwaite 1976; Mukherjee 1976; Whitfield 1978; Whitfield and Blaber 1978).

In rare Palearctic observations in USSR, small fish, large insects, shrimps, tadpoles, and small frogs recorded (Dementiev and Gladkov 1951a). Stomachs of 299 adults from West Bengal (India) contained (by weight) 57% fish, 17% crustaceans, and 26% insects. Fish included (by number) 26% *Mystus*, 17.5% *Ambassis*, 16.9% *Puntius*, 16.3% *Mugil parsia*, and 7.1% *Oryzias melastigma*; of

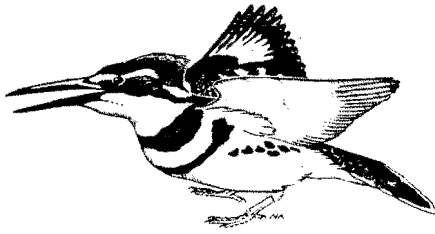
crustaceans, *Metapenaeus brevicornis* comprised 31.9%, *Macrobrachium lamerrei* 23.7%, *Cardina gracilipes* 18.1%, *Metapenaeus monoceros* 17.8%; of insects, *Eretes stictus* 21.9%, *Belostoma* 20.1%, *Corixa* 18.4% (Mukherjee 1976). In Uganda, pellet analysis showed diet almost totally fish; *Haplochromis* and *Engraulicypris argenteus* most important. Parasites and prey of fish taken also found in pellets, including larval midge *Chaoborus*, gastropod *Bellamya unicolor*, and bivalve *Corbicula africana*. Winged termites *Macrotermes* eaten throughout year, soldiers and workers taken occasionally (Douthwaite 1976). On Kafue flats (Zambia), takes mostly fish, 44% by number being Cichlidae, despite others being more abundant (Denton and Nicole 1962). Cichlidae easier to spot and, within preferred length group, are plumper, giving more food than (e.g. *Barbus* and *Alestes* (Tjornlid 1973). At Lake St Lucia (South Africa), fish comprised (mostly up to 15 g) 13 species but 80% by weight Mozambique tilapia *Sarotherodon mossambicus*; crustaceans also taken (Whitfield and Blaber 1978).

In Uganda, during first 9 days, preferred food for young is *Engraulicypris argenteus*; after this, the larger *Haplochromis* preferred; both adults and young discriminate in prey size selection. Chicks digest most bone consumed (Douthwaite 1976). BDSS

Social pattern and behaviour. Based on outlines supplied by R J Douthwaite and H-U Reyer, also on studies by Douthwaite (1978) in Uganda and Reyer (1980, 1982) in Kenya.

1. Mostly rather gregarious throughout the year, especially when roosting, breeding, and sometimes feeding (Robinson 1974; R J Douthwaite). In Bahrain, flock of over 80 reported in December (Meinertzhagen 1954). Outside breeding season in East Africa, occurs singly, in twos, or in small groups along lake shores, most groups representing family parties. (Reyer 1980.) BONDS. Monogamous mating system. Pair-bond lasts as long as mates survive, unless ♂ cuckolded by secondary helper (see below). Due to high adult mortality, only 23% of 56 pairs remained intact for more than 1 season, and none lasted more than 3. Little information about bonds outside breeding season, but 1 marked pair stayed together throughout the year (H-U Reyer). Both parents incubate (though mainly ♀), and care for young. Fledglings usually feed independently at 2-3 weeks though contact with parents may continue much longer (H-U Reyer; see also Relations within Family Group). In Kenya, probably most ♀♀ breed at 1 year, but only c. 11% of ♂♂ ($n=18$). Shortage of ♀♀ prevents most ♂♂ from breeding until 2-3 (H-U Reyer). In Uganda, Kenya, and Zambia, local variation in sex-ratio 1.5-2.5 ♂♂: 1 ♀, overall 1.8:1 ($n=1684$); ratio apparently equal in young (Reyer 1980) and bias in older birds possibly caused partly by higher mortality of dispersing juvenile ♀♀ (H-U Reyer), partly by higher predation on incubating ♀♀ (Douthwaite 1973, 1978; Reyer 1980). Surplus of ♂♂ evidently linked to flexible system of 'nest-help'. Breeding birds can have 'primary' helpers only, primary and 'secondary' helpers, or secondary helpers only (Reyer 1980, 1982; see also Douthwaite 1978). Primary helpers are mostly 1-year-old, (sometimes 2-year-old) sons of at least 1 bird of resident breeding pair, which they accompany from start of breeding season; primary helpers feed resident ♂, assist him to feed resident ♀ during courtship and incubation, assist in defending nest-site against rivals and potential preda-

tors, and in feeding young. At 2 colonies, Kenya, c. 1 in 3 pairs had 1 primary helper; 2 primary helpers recorded only twice ($n=82$ helpers: Reyer 1980, 1982; H-U Reyer). Secondary helpers are ♂ non-breeders and failed breeders, apparently unrelated to resident pair, and not firmly associated until 3-4 days after the latter's young have hatched; secondary helpers are apparently attracted mainly by adult ♀♀ which, in the case of surplus non-breeders, they try to feed before egg-laying. Would-be helpers are persistently driven off by resident ♂ until 3-4 days after his young have hatched. Thereafter they are accepted in 2-4 days during which they first bring fish to resident ♀ (H-U Reyer) but then assist in feeding young and defending nest. Tolerance of secondary helpers by resident ♂♂ varies between pairs and colonies depending on number of offspring in nest, and their ability to raise them; number of helpers greater (up to 3-4) when local conditions produce low feeding rates and demand high energy expenditure of parents (Douthwaite 1978; Reyer 1980, 1982, which see for details). Secondary helpers frequently breed in place they helped at the previous year, sometimes with the ♀ they helped (Reyer 1980, 1982). BREEDING DISPERSION. Varies with availability of food and nest-sites. Along permanent rivers where both plentiful, pairs solitary, defending linear territories for both breeding and feeding. For defence of area around feeding-perch, see Antagonistic Behaviour, below. Where feeding and breeding sites separated, and latter scarce (e.g. in large freshwater lakes of East Africa), usually colonial, pairs defending only small territory around nest-entrance (Reyer 1980; H-U Reyer). In Kashmir, *leucomelanura* forms numerous colonies of not more than c. 12 pairs each (Phillips 1946). Regularly colonial on River Tigris (Iraq), one colony 'consisting of hundreds' (see Ticehurst *et al.* 1922). In Sierra Leone, largest colonies in sea-cliffs—of at least 30 pairs; single pairs occur where suitable sites widely separated (G D Field). In East Africa, most colonies less than 20 pairs, but some, Uganda, may exceed 100 pairs (Reyer 1980; R J Douthwaite). In colonies, mean distance between adjacent nest-holes 5.2 m at Lake Victoria, 1.6 m at Lake Naivasha (both Kenya); minimum 0.5 m (Reyer 1980; see also Jourdain 1935). Nest usually abandoned after fledging; rarely, used for re-nesting same season, either by same or different pair (Reyer 1980; H-U Reyer). In some areas, same holes used year after year, though not known if by same pairs; in other areas, new holes excavated every year, even if previous ones intact. In cases of divorce between seasons, ♂ returns to former nest-site while ♀ moves (H-U Reyer). ROOSTING. Adults and immatures share common nocturnal roost throughout the year. In Kenya, roost of c. 100 birds on fallen tree (*Scopus* 1980, 3, 107-20); in Uganda, one regularly (November-December) over 200 (Douthwaite 1973; see also Meinertzhagen 1954, Douthwaite 1982). Roost usually in date palms, or in banks (Meinertzhagen 1954), also papyrus swamps (H-U Reyer). At Lomé (Togo), apparent roost area, October-December, comprised up to 50 holes excavated high on sandstone cliff; although no direct evidence, birds thought to breed in same holes at other times of the year (Robinson 1974). In Kashmir, nest-holes likewise used for roosting in winter (Phillips 1946). In Uganda (see above), birds approached roost-site by stages, often attempting to feed at each staging post (R J Douthwaite; see also Sugg 1974 for evidence of pre-roost feeding); almost all birds arrived at roost within 20 min of sunset. Birds loaf by day in much smaller groups, usually in shady tree on lake shore (R J Douthwaite). May bathe by dipping in and out of water, resorting to loafing site for preening (e.g. Dharmakumarsinhji 1955). Off-duty bird, most often ♂ during laying and incubation, guards and loafs on ground outside nest-entrance (Douthwaite 1978) or on sentinel perch nearby (Priest 1934; Greaves 1937). At Dal Lakes (Kash-



A

mir), most active 08.00–09.00 hrs and 17.00–18.00 hrs, but no clear peaks; most feeding 08.00–09.00 and 16.00–18.00 hrs (Pring-Mill 1974).

2. Alarmed or excited bird typically flicks tail up and down (Vincent 1946a; McLachlan and Liversidge 1970; Robinson 1974). Birds disturbed at communal roost scatter as when at colony (see Parental Anti-Predator Strategies). On 2 occasions, group consisting of pair and 4-month-old ♂ offspring pursued and mobbed Marsh Harrier *Circus aeruginosus* (H-U Reyer). FLOCK BEHAVIOUR. No details but see Heterosexual Behaviour (below). ANTAGONISTIC BEHAVIOUR. Birds defend individual distance (e.g. in display groups: see below), nest-holes, prey items, and sometimes territories, by threatening, fighting, and chasing. Disputes may arise over favoured perches and area surrounding them, especially when perches essential for hunting. Where fish caught predominantly by hovering, no feeding territories held (Dharmakumarsinhji 1955; Reyer 1980; H-U Reyer). Bird has 2 threat postures: in defensive Wings-spread posture (Fig A), stands upright and half-extends wings in vertical plane; in aggressive Forward-threat posture (Fig B), leans forwards, directing bill towards opponent, with wings half raised and tail fanned (Douthwaite 1978; H-U Reyer). Both postures usually accompanied by Advertising-calls (see 5 in Voice), Forward-threat posture also by Aggressive-calls (see 6 in Voice). Rival may submit by turning away, often with bill pointing downwards, and giving Appeasement-call (see 7 in Voice). Alternatively, threatened bird may adopt a threat posture: if Wings-spread posture adopted, the 2 birds may then jump at each other; if Forward-threat posture, the 2 peck and snap, leading to a fight (H-U Reyer). Outright fighting rare except during ground-display (see Heterosexual Behaviour, below) at start and end of breeding season. Fighting birds, usually ♂♂, may briefly grasp each other's wing, or grab and twist at bill (R J Douthwaite). Birds seeking secondary helper status at nest (see Bonds, above) often threatened and chased off by resident ♂♂; chasing prolonged if pair have few nestlings and no need of help (Reyer 1980). In period of food shortage, Botswana, flying birds often attacked and disrupted feeding activity of others (Douthwaite 1982). Dispute over food may lead to brief tussle over fish in mid-air (H-U Reyer). HETEROSEXUAL BEHAVIOUR. (1) Pair-bonding behaviour. Return to colonies marked by groups of 3–8 birds chasing high over colony area (Douthwaite 1978; R J Douthwaite). At roost-site, Sierra Leone, 12 birds performed aerial display (not described), accompanied by calling (G D



B

Field). When burrows being excavated, flying flocks land and display on open ground; ♂♂ outnumber ♀♀, but both sexes display in similar fashion. 1 or more birds adopt Wings-spread posture and turn about within group, giving Advertising-calls. Display lasts a few seconds and is usually repeated several times. If display directed at particular bird, latter responds with same display or else Appeasement-call (Douthwaite 1978; R J Douthwaite). Ground-display here thought to establish and maintain bonds with mates and primary helpers. When Advertising-call given (usually without any threat posture), serves as Meeting-ceremony—during and after pair-formation—between members of pair and with accepted helpers (H-U Reyer). Behaviour of excited bird, apparently in courtship, said to include raising of crown feathers, wing-quivering, tail-flicking, and calling (Phillips 1946). In alleged courtship display, bird flew to and fro above perched bird (presumed mate) with gradually lengthening swoops, just above bird's head (Hutson 1954). (2) Courtship-feeding. Occurs most often outside nest-hole (H-U Reyer). Begins during nest-excavation and ends when young hatch. Immediately before and during laying, ♀♀ become very passive, seldom flying except to receive food from mate (Douthwaite 1978) who may supply all her food during laying (R J Douthwaite). Soliciting ♀ gives Begging-call (see 8 in Voice) and often also adopts Begging-posture: body upright, with crest raised and bill pointing almost vertically down (H-U Reyer). ♂ holds fish such that head nearest bill-tip, and, usually after brief tussle, transfers it to ♀ (R J Douthwaite), often to accompaniment of calls (H-U Reyer: see 9 in Voice). ♀ then pecks at ♂ who leaves (H-U Reyer). ♂ may hover to pass fish to perched ♀ (Robinson 1974). Primary helpers regularly feed ♀♀ (Reyer 1980, 1982). One 4-month-old ♂ offered fish to ♀ parent outside breeding season (H-U Reyer). (3) Inter-♂ feeding. Resident ♂ sitting outside nest-entrance during laying and incubation sometimes approached by primary helper or intending secondary helper offering fish. Resident ♂ usually seized fish and most often ate it after a tussle, whereupon other departed. Occasionally ♂ refused fish, responding with Appeasement-call (Douthwaite 1978). If accepted, fish sometimes passed to mate (Reyer 1980). ♂-♂ feeding (and ♂-♀ feeding: H-U Reyer) occurs throughout the year, sometimes well away from colony, but often outside nest in which ♀ incubating (Douthwaite 1978). (4) Mating. Usually occurs near nest-hole, often after courtship-feeding (H-U Reyer); most often in first 2 hrs of daylight (R J Douthwaite). Soliciting ♀ adopts Begging-posture but with tail slightly raised and body less upright; also gives Begging-call. ♂ approaches ♀ in Forward-threat posture, uttering Aggressive-call, and ♀ then turns away and crouches. ♂ mounts and, during copulation, grasps ♀'s forehead with bill, and beats wings. During copulation, calls given (see 10 in Voice). Copulation lasts c. 7–10 s, and afterwards, ♀ often drives ♂ away by pecking (H-U Reyer). (5) Behaviour at nest. No information. RELATIONS WITHIN FAMILY GROUP. Eyes of young open over 5–9 days. Food-call of young changes after a few days (Douthwaite 1978; R J Douthwaite: see Voice). Young fed from 1st day by ♂, and by helpers if present. Later, when brooding declines, ♀ usually takes increasing share in feeding (Reyer 1980). However, parental role varies with degree of helper support; sometimes, where up to 4–5 ♂♂ involved (including ♂ of pair), ♀ plays no part in feeding young (Douthwaite 1969); at other nests, where brood small, pair may raise young unaided by secondary helpers (Douthwaite 1969; Reyer 1980). When inadequate food given to captive brood of 5, strong inter-sibling rivalry arose, heavier nestlings pushing others aside, and thereby receiving most food. Young accept food as readily from helpers as from parents (Reyer 1980). For evidence of helpers feeding recently fledged young, see Douthwaite

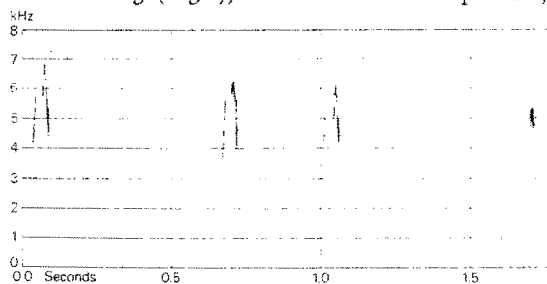
(1978). Parents coax young to fledge with Contact-call (see 4 in Voice). Newly fledged young remain near nest-hole for 1–2 days during which they usually perch to receive food. Thereafter they fly towards parents approaching with fish; often after long chase, parent transfers fish in mid-air but offspring returns to perch to swallow it. Within 3 days of fledging, young capable of shaking and battering fish; in colonial dispersion, young then leave colony-area and stay near fishing grounds, and within 2 weeks can dive and successfully catch fish (Douthwaite 1978; Reyer 1980; H-U Reyer). Juveniles fed by adults usually for less than 1 month after fledging and can be independent at 2–3 weeks (H-U Reyer). When food became short after young self-feeding at 2 months, they begged with 'pitchek' call (see Voice), sometimes successfully, from presumed parents (R J Douthwaite). Juvenile ♀♀ appear to leave parents and natal area at 3–4 months, when they start moulting. In one case, juvenile ♂ remained with parents throughout the year; others arrive in colony with parents at start of breeding season, suggesting family bonds maintained during the year after fledging; such offspring typically serve as primary helpers if they fail to find mates (Reyer 1980; H-U Reyer). ANTI-PREDATOR RESPONSES OF YOUNG. No information. PARENTAL ANTI-PREDATOR STRATEGIES. (1) Passive measures. No information. (2) Active measures: against birds. If predator approaches colony, alerted bird gives Alarm-call (see 2 in Voice), whereupon birds in the open perform silent, low-level rush out over water, often dipping in then flying off in a different direction (R J Douthwaite). (3) Active measures: against man. On approach of intruder, alarmed birds gave Alert-call (see 1 in Voice) while circling slowly with bursts of 3–4 rapid and exaggerated wing-beats alternating with glides (Douthwaite 1978; R J Douthwaite). Parents with young also give Alarm-calls (H-U Reyer). (4) Active measures: against other animals. Domestic dog treated as man. In Uganda and Kenya, snakes, ground squirrel *Xerus*, and mongoose *Herpestes* elicit Alert-call and are swooped on by 2 or more birds (only those with eggs or young: H-U Reyer), and occasionally struck on tail; monitor lizard *Varanus niloticus* also struck on head (Douthwaite 1978; R J Douthwaite, H-U Reyer).

(Figs A–B from drawings in Douthwaite 1978.)

EKD

Voice. Freely used, especially in breeding season. Following scheme compiled from outline and recordings supplied by H-U Reyer from studies in Kenya, supplemented by outline supplied by R J Douthwaite from studies in Uganda.

CALLS OF ADULTS. (1) Alert-call. High-pitched 'quick' or 'quick-ick', repeated irregularly (Douthwaite 1978); rendered 'kwik-kwik' (Mackworth-Praed and Grant 1962) or 'kik-kik' (Serle *et al.* 1977). In recording by P A D Hollom of 2 birds feeding, call has liquid quality (P J Sellar). In recording (Fig I), a staccato 'trit' at sporadic, fairly



I H-U Reyer Kenya May 1976

short intervals (E K Dunn). Frequently given by single birds shortly before take-off, while flying, and on alighting; with increasing disturbance and threat, progressively merges with call 2 (H-U Reyer). (2) Alarm-call. Low-pitched 'jerp' (Douthwaite 1978). In recording by H-U Reyer, sound resembles 'trrr trrr trrr' (E K Dunn). At low intensity, given irregularly but rate of repetition and volume increase when danger greater (H-U Reyer). Often given by parents with young of any age in presence of intruder (Douthwaite 1978; H-U Reyer). (3) Distress-call. Shrill, rapidly repeated 'preepreepreepree' (E K Dunn), given by trapped bird (H-U Reyer). (4) Contact-call. 'TREEtiti TREEtiti' (E K Dunn: Fig II) or 'kittle te ker' (Douthwaite 1978), repeated every 0.5–2 s by bird arriving at or departing from nest; also given by parents coaxing young to fledge, and by birds flying towards roost. Probably signals that bird is arriving or leaving (or intends to do so), and may also express invitation to follow (H-U Reyer). (5) Advertising-call. High-pitched, staccato 'CHICKkerker' (Fig III), repeated irregularly and given in defence of nest-site or perch, often in a threat posture; also often in Meeting-ceremony (R J Douthwaite, H-U Reyer; see Social Pattern and Behaviour). (6) Aggressive-call. Shrill, repeated 'shreeur', usually given by ♂ in Forward-threat posture when confronting rival, or approaching mate with intention of copulating. Similar call (in recording, an extended 'shreeee': E K Dunn) given by bird in front of nest-hole as mate approaches it to excavate. May express conflict between approaching and staying/retreating (H-U Reyer). (7) Appeasement-call. Loud, crescendo then diminuendo 'werk ... werk ... werk werkwerkerkerk erk' or 'sooip ... sooip ... sooip sooipsooipipipipip' (Douthwaite 1978). In recording (Fig IV), begins with a few 'werk-' sounds, then breaks into series of 'sooip' sounds which increase in rate of delivery, ending in volley of 'ip-' sounds (E K Dunn). Given in response to call 5, or by perched birds after call 4, apparently mainly by subordinate individuals, thus more often by ♀♀ and helpers than by resident ♂♂ (H-U Reyer; see also Calls of Young, below). (8) Begging-call. In recording by H-U Reyer a sharp, brief 'pi-chee' (E K Dunn), repeated a few to several times. Regularly given by ♀ to solicit food from mate, primary helpers, and other birds. Also given by ♀ inviting copulation, when probably serves partly to appease ♂ (see call 6), as it may also when given by subordinate ♂ on approach of more dominant ♂ (H-U Reyer). (9) Courtship-feeding calls. In recording, a complex sequence of soft warbled sounds and chirps, given probably by both birds during transfer of fish. One sound, slightly similar to call 6, increases in occurrence when pair tussle over fish (H-U Reyer). (10) Copulation-call. Very soft 'pre-' or 'pirree-' sounds given sporadically during copulation; not known whether by one or both participants (H-U Reyer).

CALLS OF YOUNG. Food-call of young 1–2 days old a grating, repeated 'scare'. After c. 2 days, and up to a few

days old, young give repeated, high-pitched 'choop' when hungry. Thereafter, and up to a few days after fledging, call changes to a loud, penetrating, continuously repeated 'cherr erh'; 1st 'cherr' produced on exhalation, 'erh' on inhalation; given just before being fed. From c. 10 days after fledging, young repeatedly call 'pip weep' or 'pitchek' at intervals of c. 5 s when flying, or when perched and another bird flies past; probably a food-begging call (R J Douthwaite). For ages at which adult calls develop in fledged young, see Douthwaite (1978). HI-UR, EKD

Breeding. SEASON. Egypt: eggs laid March–May (Dementiev and Gladkov 1951a; Etchécopar and Hüe 1967). SITE. Tunnel in bank, over water or dry ground. Colonial or solitary. Nest: excavated tunnel 80–250 cm long, shorter in hard ground, with chamber at end c. 45 × 24 × 15 cm high (Douthwaite 1978). Unlined, but with increasing litter of fish-bones. Building: by both sexes. EGGS. See Plate 98. Short elliptical, smooth and fairly glossy; white. 29 × 24 mm (26–32 × 22–25), $n = 133$; weight 8.2 g (6.7–10.4), $n = 34$, Uganda (Douthwaite 1978). Clutch: 4–5 (1–7); average of 22 clutches, Uganda, 4.9 (Reyer 1980). Small and large clutches may be replacements, latter containing eggs from previous clutch (R J Douthwaite). One brood, possibly 2. Replacements laid after egg loss. Laying interval 1 day. INCUBATION. About 15 days. Begins with 1st egg; hatching asynchronous, over c. 3 days (Douthwaite 1978). By both sexes, but more by ♀, who sits through night and during part of day (Douthwaite 1978). YOUNG. Altricial and nidicolous. Cared for and fed by both parents. FLEDGING TO MATURITY. Fledging period 23–26 days, Uganda (Douthwaite 1978). Become independent within 2 months of fledging. Age of first breeding 1 year, though some ♂♂ not until 2 (Douthwaite 1978). BREEDING SUCCESS. No data from west Palearctic. Of 58 clutches, Uganda, 52% hatched, and 50% fledged, with average 4.5 young per brood. Fledging success significantly increased by helpers (see Social Pattern and Behaviour): 39% of hatched birds fledged with no helpers involved, 78% with 1 helper, and 100% with 2 (Douthwaite 1978; Reyner 1980).

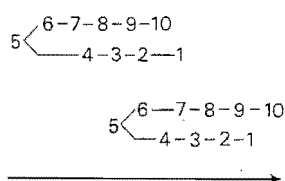
Plumages (nominate *rudis*). ADULT MALE. Forehead and crown black; sides of feathers narrowly edged white when fresh, slightly wider towards hindcrown, appearing streaked white when plumage fresh, black with limited traces of white streaks on forehead and hindcrown when plumage worn. Large triangular white patch on lores, extending into white streak over eye towards nape (narrow just above eye, wider above ear-coverts); nape white with limited black streaking, but white usually hidden below mainly black elongated crown feathers. Black patch in front of eye and below eye from gape over ear-coverts, narrowly streaked white below eye and on ear-coverts; remainder of head and neck white with narrow black streak from ear-coverts down sides of neck and dusky streaks on central hindneck. Feathers of mantle, back, and rump, scapulars, and upper tail-coverts with basal half white and terminal half black, latter with white fringe 1–4 mm wide at tip; black of tail-coverts and shorter scapulars with 1 white blob on each side, longer scapulars with 1–2 blobs. In fresh

plumage, upperparts appear black with marked white scaling; when worn, white feather-fringes partly lost by abrasion and upperparts appear more uniform black, but much white of feather-bases sometimes then exposed. Chest with distinct black band, wide at sides, narrowing slightly towards centre (feathers narrowly tipped white when fresh; some grey or white of feather-bases visible when worn), a narrower 2nd black band below it across breast; remainder of underparts white, but some black blobs and streaks on lower flanks and thighs, sometimes giving hint of 3rd partly developed band on sides of lower belly. Basal half of central tail-feathers (t1) white with some black blobs or broken bars, distal half black with terminal 5 mm white; black on other tail-feathers gradually reduced towards outer, forming black band of 15–20 mm wide on tip of outermost, again with terminal 5 mm white and with white blotches at side, neighbouring 1–2 feathers often also blotched white in middle of black of inner web (giving indication of white band in middle of black on undertail); white middle portion of variable number of outer feathers with 1–2 black blotches (giving indication of black bars proximal to broad black band on uppertail). Basal $\frac{2}{3}$ of primaries white, terminal $\frac{1}{3}$ black with narrow white tip (widest on innermost); black of tip extends in tapering point to shaft; outer web of (p8–)p9–p10 black except for narrow white outer edge on p10 and similar edge to bases of others; basal $\frac{2}{3}$ of outer web of p6–p8 either all white or partly spotted black. Secondaries white, terminal $\frac{1}{3}$ of outer web of middle ones with 2–3 black blotches narrowly connected by black along shaft; terminal half of outer web of s3–s4 black with some white blotches, black extending partly to inner web; outer web of s1–s2 largely black, and black on terminal half of inner web extensive; tertials with terminal halves largely black; all secondaries with white tip, c. 0.5 cm wide on middle ones, narrower on outer and inner. In closed wing, secondaries white with 2–3 black subterminal bands, bordered by mainly black outermost secondaries and tertials; in spread wing, middle secondaries largely white with bands broken into 2–3 rows of black blotches. Greater upper primary coverts and bastard wing largely black, lesser mainly white. Greater upper wing-coverts white with black subterminal blotches; outermost and tertial coverts more extensively tipped black like corresponding secondaries and tertials; longer median upper wing-coverts white (forming white panel across wing), outermost with large black tips; remaining smaller upper wing-coverts black with broad white fringes. Marginal coverts, under wing-coverts, and axillaries white. ADULT FEMALE. Like adult ♂, but lower band across breast absent and upper band on chest restricted to large black patches at sides, either interrupted by white in middle or (occasionally) connected by narrow black line. NESTLING. Naked at hatching. Feather-pins appear at 7th day (at 3 weeks on belly and vent); flight- and tail-feathers breaking out of sheaths at 11–13 days; scapulars, wing-coverts, and tail-coverts fully grown at 15 days; eye well open by 9 days (Douthwaite 1978). JUVENILE. Like adult ♀, but white patch on lores and white supercilium partly speckled black; loreal patch appearing larger but less sharply defined and supercilium less distinct, latter occasionally almost absent; mantle, scapulars, back, rump, and upper tail-coverts more extensively black, rump and upper tail-coverts especially with less white of feather-bases visible; white cheeks, lower throat, and sometimes upper throat and upper breast with black fringes or spots on feather-tips (occasionally, almost absent); black band across chest with much grey of feather-bases visible, not solid black and usually not interrupted in middle as in many adult ♀♀; no trace of adult ♂'s 2nd band across breast; flanks more profusely streaked, without adult's limited number of bold black spots; flight-feathers as adult, but less white on tips of primaries (but abraded soon at any age), more extensively

black on outer web of p6–p10; secondaries largely black, only limited amount of white on base and on inner border of inner web of middle and inner secondaries, outer webs with 2–4 rather small white blobs along outer edge only, usually absent on s1–s3(–s4). Upper wing-coverts as adult, but black often more extensive; median coverts usually blotched black, black on tips of innermost reaching tips, unlike adult. Much variation in amount of black on upperparts and upperwing; some juveniles as white as adult, while a few adults show relatively limited white, approaching dark juveniles; ageing on amount of white alone not reliable, except for extremes. **FIRST ADULT.** As adult, separable only when some juvenile upper wing-coverts (darker than fresh neighbouring ones) or all juvenile primaries (all equally fresh or worn, not mixture of old and new as in adult) retained. Usually inseparable once primary moult started at c. 6 months old.

Bare parts. ADULT AND JUVENILE. Iris dark brown. Bill black, paler at base of lower mandible; mouth blue-grey in adult, pink in juvenile at fledging. Leg and foot black, soles pink, yellow, or black. **NESTLING.** Pink at hatching; future feather-tracts of crown, nape, scapulars, tail, and wing darken to grey from 4th day, remainder (except belly and vent) from 6th; bill, leg, and foot (except soles) blackening from c. 1 week. (Sugg 1974; Douthwaite 1978; BMNH, RMNH.)

Moult. ADULT POST-BREEDING. Partial; primaries ascendant and descendant, starting from p5. Sequence of primaries 5–6–7–4–8–3–9–2–10–1; starts with p5 at end of nesting period; as moult slow (within each ascendant and descendant series, each feather usually not shed before neighbouring one full-grown), usually not completed when following nesting period starts and moult then suspended, e.g. with p9–p10 and p1–p2 still old. In following moult period, resumed from point of suspension and fresh series also starts again with p5, e.g. moult may start after nesting with p9, p2, and p5. (Douthwaite 1971a.) In sample of c. 100 west Palearctic birds (BMNH, ZFMK), active wing moult mainly May–January in Egypt, July–March in Middle East; 1–2 primaries growing simultaneously in one wing, rarely 3–4 (average 1.6, $n=37$); upon suspension, 4–10 primaries new (average 6.1, $n=48$); old primaries retained after suspension usually replaced in next moulting season, and only 2 birds showed moult pattern explainable only by retention of some feathers until 3rd moulting season; after suspension during nesting, new series did not start automatically, in contrast to findings of Douthwaite (1971a)—p5 of new series usually lost when p8 or p9 (or p10) of previous series growing, and when moult suspended with (e.g.) up to p6 (new series) and up to p9 (old series) new, moult continued in next moult season with p7 and p10 only, without starting a fresh (3rd) series again with p5. Moult sequence thus probably



and this can be interrupted by suspension at any point. Replacement of single set of primaries takes 180–193 days when not interrupted (Douthwaite 1971a). Secondaries replaced ascendantly and descendantly from s13, and ascendantly from s1, sequence 13–12–11–10–9–14–8–7–1–6–2–5–3–4; when not suspended (though it usually is), whole replacement takes c. 260 days; a new series usually starts before previous one completed (Douthwaite

1971a). In west Palearctic birds, body and tail apparently completely renewed June–December. **POST-JUVENILE.** Complete, but moult suspended once nesting started and completion may require 2 moulting seasons. In west Palearctic, head and body first, starting with scattered feathers of neck, mantle, and outer scapulars from April–August; head, body, and tail new October–December, but some wing-coverts usually still juvenile then. Sequence and duration of flight-feathers as in adult. In captive birds, secondaries started c. 160 days after hatching, primaries c. 180 days (Douthwaite 1971a). In west Palearctic, p1 shed July–February; many 1-year-olds retain old outer and inner primaries and all retain part of outer secondaries when moult suspended during breeding season.

Measurements. Nominate *rudis*. Turkey, Cyprus, Levant, and Iraq, all year; skins (BMNH, RMNH, ZFMK, ZMM). Bill (F) from tip to forehead (exposed culmen on average 3.5 less), bill (N) from tip to distal corner of nostril, both in adult only.

WING AD	♂ 146 (1.50; 13)	145–149	♀ 147 (1.61; 19)	144–151
BILL (F)	62.2 (2.64; 15)	58–67	62.1 (1.94; 14)	60–66
BILL (N)	49.3 (2.37; 15)	47–53	50.5 (1.63; 13)	48–54

Sex differences not significant. Juvenile wing on average c. 3 shorter than adult; juvenile bill full-grown once 1st adult plumage on body attained. In East Africa, bill full-grown at 3–4 months (Douthwaite 1978).

Egypt from Nile delta and Faiyum to 25°N, all year; skins (BMNH, RMNH, ZFMK; Giza Zoological Museum per S Goodman and P L Meininger).

WING AD	♂ 140 (2.03; 25)	137–144	♀ 141 (2.85; 24)	138–145
JUV	140 (3.69; 8)	134–144	139 (3.18; 8)	135–143
TAIL AD	73.2 (2.33; 17)	69–77	74.4 (2.82; 16)	70–79
JUV	74.2 (3.12; 6)	70–78	70.9 (2.02; 4)	68–73
BILL (F)	61.8 (2.83; 22)	58–68	60.7 (2.46; 22)	57–65
BILL (N)	49.3 (2.77; 22)	46–55	48.6 (2.36; 22)	45–54
TARSUS	11.3 (0.38; 13)	10.9–12.2	11.6 (0.71; 12)	11.0–12.6
TOE	20.3 (0.62; 11)	19.7–21.4	20.0 (0.97; 11)	18.5–21.2

Sex differences not significant. Wing of Egyptian birds significantly shorter than those of Middle East ones, 5 adults from Middle East below 146 and 2 below 145 (mainly from Iraq), and only 3 Egyptian birds over 144.

Sexes combined, all year, sources as before. Nominate *rudis*: (1) Middle East; (2) northern and Middle Egypt; (3) Upper Egypt (Aswan area) and northern Afrotropics (Sénégal to Ethiopia); (4) Liberia to Zaïre and northern Angola; (5) southern Kenya and Tanzania; (6) South Africa (McLachlan and Liversidge 1970; RMNH). *C. r. leucomelanura*: (7) India, Ceylon, and southern China.

	WING AD	BILL (F) AD
(1)	147 (1.56; 32) 144–151	62.2 (2.29; 29) 58–67
(2)	141 (2.45; 49) 137–145	61.2 (2.68; 44) 57–68
(3)	139 (1.10; 14) 137–141	58.4 (2.76; 13) 56–60
(4)	134 (2.70; 32) 128–138	62.7 (4.06; 15) 60–69
(5)	132 (4.10; 11) 128–137	61.7 (3.18; 11) 58–66
(6)	140 (— ; 38) 132–146	61.0 (1.32; 4) 59–62
(7)	139 (4.11; 7) 135–145	66.4 (3.34; 7) 63–72

Weights. Nominate *rudis*. Iran, February: ♂ 95 (Diesselhorst 1962). Adult, Kenya, March–November: ♂ 82.4 (6.03; 189) 68–100, ♀ 86.4 (7.38; 96) 71–110 (Sugg 1974). Adult, Zaïre, August–January: ♂ 65 (4) 56–72, ♀ 61, 69 (Verheyen 1953). At hatching, average c. 8; at 10th day, 55.1 (15.2; 9) 33–80; at 15th, 101.0 (7.44; 4) 93–111; peak reached on c. 19th day, 122 (3) 110–134, fledging on 24th–25th at 94.6 (3.78; 5) 89–99 (Douthwaite 1978).

Structure. Wing rather long and broad, tip fairly rounded. 10 primaries: p8 longest, p9 0.5–3 shorter, p10 and p6 9–13, p7 1–5, p5 19–24, p4 26–30, p1 38–46. Outer web of (p7–)p8–p9 and inner web of p8–p10 slightly emarginated. Tail rather long, tip square; 10–12 feathers. Bill long, straight, sharply pointed; gradually tapering towards tip or with slightly convex gonys; wide and deep at base, but not as bulbous as in *Halcyon* kingfishers, with middle and tip more strongly compressed laterally. Nostrils rather small, narrow, partly covered by thin flap above. Feathers of hindcrown and nape narrow and elongated, forming ragged crest. Leg and foot short and slender, lower tibia and tarsus bare. Soles flattened, front toes partly joined at base; outer toe c. 88% of middle, inner c. 68%, hind c. 54%. Middle claw rather long, others short, strongly curved.

Geographical variation. Within Middle East and Africa, no variation in colour (except between individuals), but marked in size (see Measurements). Middle East birds distinctly larger than those of Africa (wing 144–151, tail 78–82), bill slightly heavier at base and distinctly deeper in middle, gonys more markedly

curved. Birds of northern Afrotropics (including those of southern Egypt) tend to have short bill. Birds of West, central, and East Africa have distinctly shorter wing than elsewhere in Africa, and should perhaps be separated as *bicincta* (Swainson, 1837). *C. r. leucomelanura* from southern Asia differs by completely white tail-base, without traces of bars proximal to broad black band across tip, except sometimes on 1–2 outer feathers; no white spots in middle of black band on outer tail-feathers (thus no broken white bar in black tip of undertail). White feather-tips on upperparts slightly wider, crown more heavily streaked white; fewer black blotches on white of outer web of p5–p8; black marks on upper wing-coverts and underparts often larger. Some geographical variation within *leucomelanura*: birds from north-east China (sometimes separated as *insignis* Hartert, 1910) average larger than Indian birds, with bill deeper at base and middle (Vaurie 1959e). *C. r. travancoreensis* from Kerala south to Cape Comorin (south-west India) similar to *leucomelanura*, but upperparts appear darker, white being less extensive and tinged grey; flanks more profusely spotted black (Ali and Ripley 1970).
CSR

Ceryle alcyon Belted Kingfisher

PLATES 67 and 68
[between pages 686 and 687]

Du. Bandijsvogel Fr. Alcyon ceinturé Ge. Gürtelfischer
Ru. Ошейниковый зимородок Sp. Alción Sw. Bälteskungfiskare

Alcedo alcyon Linnaeus, 1758. Synonym: *Megaceryle alcyon*.

Monotypic

Field characters. 28–35 cm, wing-span 47–52 cm; bill 5 cm. Largest kingfisher to occur in west Palearctic; size of Jackdaw *Corvus monedula*, and up to 30% larger than Pied Kingfisher *C. rudis*. Huge, powerful, broad-winged kingfisher, with large crested head, dark grey upperparts contrasting with white throat and almost complete neck-collar, dark chest, and white underbody. Flight powerful, with action like that of *C. rudis*. A noisy bird. Sexes dissimilar; no seasonal variation. Juvenile separable.

ADULT MALE. Large, black, dagger-shaped bill. Head, broad chest-band, and upperparts dusky blue; chin, throat, almost complete collar round neck, and most of underbody white. At close range, small white marks visible above and below eye. Scapulars and all wing-feathers except outer primaries show white tips and notches on inner webs, notches large enough on middle primaries to form white patch at base of feathers. When visible, dusky blue flanks show barred lower edge. **ADULT FEMALE.** Differs from ♂ in having flanks and a 2nd lower and narrower chest-band markedly rufous. **JUVENILE.** Bill distinctly shorter and chest-band(s) mixed dusky blue and red-brown. ♂ may show vestiges of 2nd chest-band.

Unmistakable, resembling only extralimital Giant Kingfisher *Ceryle maxima* (confined to Africa south of Sahara), which is larger (c. 40 cm) and has extensive

chestnut below. Flight of *C. alcyon* powerful, with actions closest to *C. rudis* but wing-beats even more flapping; although heavy in build, mastery of sudden hover, bounding dashes, and headlong plunges (producing loud splash) as marked as in smaller kingfishers. Behaviour typical of Alcedinidae, but will feed on invertebrates away from water. Not shy, perching conspicuously on both branches and artefacts like telephone wires.

Advertises presence with loud, harsh rattle, sounding almost mechanical and carrying far.

Habitat. In Nearctic, from arctic Alaska through boreal, temperate, subtropical, and tropical zones, ranging in Rocky Mountains above 2500 m. Breeds almost anywhere near water supporting aquatic animal populations, where bluffs, road cuts, gravel-pits, sand-banks, or other similar nearly vertical earth exposures provide suitable nest locations. Forages up to c. 8 km from nest-site (Johnsgard 1979). Prefers clear water, either fresh or salt: lakes, ponds, rivers, streams, and water near shore or islands, not too far from elevated perches such as trees, posts, or telephone wires. Breeding populations in rocky areas limited by availability of nesting sites (Godfrey 1966). Avoids open, arid, treeless country. Some winter as far north as there are still open streams or tidal creeks (Forbush and May