Nest building and nest destruction by the masked weaver, *Ploceus velatus*

H.R.G. Howman and G.W. Begg
Harare, Zimbabwe, and Oceanographic Research Institute, Durban

This paper describes a series of observations relating to the building and destruction of nests by a single masked weaver, *Ploceus velatus,* over a period of six consecutive years (1975 – 1980 inclusive). Contrary to previous published accounts the period of most intensive activity preceded the rainy season, and nest destruction was as conspicuous as nest construction throughout the eight month breeding season. The choice of nest sites was recorded and the process of nest construction and destruction described.

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Hierdie artikel beskryf 'n reeks waarnemings in verband met die bou en vernietiging van neste deur 'n enkel manlike geelvink, *Ploceus velatus,* oor 'n tydperk van ses opeenvolgende jare (1975 – 1980). In teenstelling met waarnemings in vorige publikasies, het die tydperk van die intensiefste aktiwiteit die reënseisoen voorafgegaan, en beide nesbou en -vernietiging was opvallend gedurende die agt maande broeiseisoen. Die keuse van die ligging van neste is aangeteken en die proses van nesbou en -vernietiging word beskryf.

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H.R.G. Howman
21 Sevenoaks Drive, Mayfield Park, Harare, Zimbabwe
G.W. Begg*
Oceanographic Research Institute, P.O. Box 10712, Marine Parade 4056, Durban, Republic of South Africa
*To whom correspondence should be addressed

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Although the masked weaver *Ploceus velatus* is a widespread and common bird there is surprisingly little published information on the biology of this species. Taylor (1946) is one of the few relevant publications, this being drawn upon for McLachlan & Liversidge (1957). There are short notes by Cooper (1970), Prozesky (1977) and Williams (1977) , whilst the information contained in Alston (1951) is unscientific and extremely suspect. On the other hand comprehensive studies have been undertaken on various other ploceine weavers, notable amongst which are those of Skead (1947) on the Cape weaver *Ploceus capensis,* Collias (1964) and Collias & Collias (1962, 1963, 1967) on the spotted-backed (or African village) weaver *P. cucullatus.*

This paper presents a series of observations relating to the nesting behaviour of a single male masked weaver over a period of six years (1975 – 1980 inclusive) in a suburb of Harare (formerly Salisbury), Zimbabwe. Although the bird was not ringed for positive identification, there is very little doubt that the same individual was under observation for this entire period. This is because of the great familiarity of the observer (HRGH) with the habits of the bird, such as its flight paths; favourite perches for 'guard-duty', preening or resting; preferred nesting sites and the lack of any evidence to suggest the arrival of a newcomer. Further confirmation comes from Cooper (1970) after observations on a ringed individual and Craig (A. pers. comm.) who states that there is a recent record of a male masked weaver recaptured at the same colony where it had been ringed 14 years before.

Nest-building behaviour

Duration of the building season

Table 1 shows that the masked weaver under observation, built, or started to build, 160 nests over the six year study period (1975 – 1980 inclusive) and that his output varied from 22 to 36 nests each year. This result is similar to that of Cooper (1970) who reported the construction of 23 nests during one season by a single male masked weaver, ringed in the previous year, also in Harare, Zimbabwe. In essence the building season, throughout which the male was in active reproductive condition, was of eight months duration (although a mean of 236 days is indicated by Table 2) and confined to the months of June to January inclusive. Fifty-six percent of the nests were built in spring (taken to extend

Table 1 Seasonal variation in nest production of a single male masked weaver *(Ploceus velatus)* during a six year study period

Season	Winter			Spring			Summer			Autumn			Total
	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	
1975/76	1	3	3	5	2	3	1	2	2	–	–	–	22
1976/77	–	4	1	3	4	4	3	4	3	–	–	–	26
1977/78	–	1	–	3	7	4	3	6	2	–	–	–	26
1978/79	–	–	1	6	10	4	3	6	1	1	–	–	32
1979/80	–	1	2	7	5	6	7	7	1	–	–	–	36
1980/81	–	–	1	1	12	3	1	–	–	–	–	–	18
Total	1	9	8	25	40	24	18	25	9	1	–	–	160
Percentage for each season		11%			56%			33%			0%		100%

Table 2 Duration of the building season in days, if taken to extend from the day of the first nest built to the last day the last nest was destroyed

Season	Specific dates	No of days
1975 – 1976	30 May – 5 Feb	252
1976 – 1977	7 Jun – 4 Mar	249
1977 – 1978	21 Jun – 25 Jan	219
1978 – 1979	18 Jul – 20 Feb	218
1979 – 1980	1 Jun – 30 Jan	244
1980 – 1981	30 Jul – 15 Nov	109
		236 mean

Table 3 Choice of nest sites. (Height above ground level in metres)

Season	A *Combretum molle* 4,6 – 5,6m	A *Combretum molle* 5,6 – 6,6m	B *Brachystegia spiciformis* 5,6 – 6,6m	C *Bougain villea* ?	Unrecorded	Total
75 – 76	11	–	–	1	10	22
76 – 77	17	1	–	7	1	26
77 – 78	17	2	6	1	–	26
78 – 79	12	1	19	–	–	32
79 – 80	8	1	26	–	1	36
80 – 81	8	10	–	–	–	18
Total	73	15	51	9	12	160
Percentage	46%	9%	32%	6%	7%	

from August to October), during which period the weather is dry (Figure 1). Only in 1980/81 did the onset of the rains coincide with building activity.

The period of most intensive activity in terms of nest construction and nest destruction (Figure 2) extended from August to December, although, during those five months, there were periods lasting from 6 to 36 days during which the weaver did not undertake any building work (Figure 1).

Nest orientation

The main nesting site consisted of two trees, a musasa *Brachystegia spiciformis* and a velvet bushwillow *Combretum molle* approximately 10 m apart and both 8 m in height. A nearby *Bougainvillea* was also used occasionally. Without exception nests were always built on the southern and western aspects of the nesting tree, almost certainly for protection from the prevailing northeasterly and easterly winds. Orientation of the nest entrance was determined by the nature of the branch selected for construction as well as configuration of its terminal twigs.

More often than not the weaver stripped all the leaves from the branches it selected for nest construction but ensured, wherever possible, that a tuft of 2 – 5 leaves remained at the end. This tuft either became incorporated into the roof of the nest structure or was left to protrude above or beyond the nest. If the tree was in a leafless condition, tufted branches were chosen in preference to any other. However an exception to this rule was nest 14 of 1977 (abbreviated as 14/77) built at the end of a dead *Bougainvillea* branch. The removal of emergent leaf buds was witnessed on several occasions.

The height of the nests (Table 3 and Figure 3) varied from 4,6 – 6,6 m above the ground. The most important criterion governing the level at which nests were built seemed to be the proximity of any undergrowth to the nesting branches, especially if there was the tendency for a selected branch to droop downwards whilst it grew. The reason for this probably stems from a fear of increased vulnerability from predators such as snakes, as suggested by Prozesky (1977). As can be seen from Figure 3, the lower branch of the *Combretum* tree, which had for two years been the favourite building branch, suffered from this disadvantage because it eventually drooped too close to the pomegranate bush below. Thus, in the 1977/78, 1978/79 and 1979/80 seasons, building activity was transferred higher to the musasa site. The sagging branch was propped up as shown, on 11 December 1977 too late in the season to show any change. However in the following year, our suspicions were confirmed when, by artificially propping up the *Combretum* branch (on 22 October 1978), a positive response from the bird was elicited, as another eight nests were built on the propped branch before the end of the season.

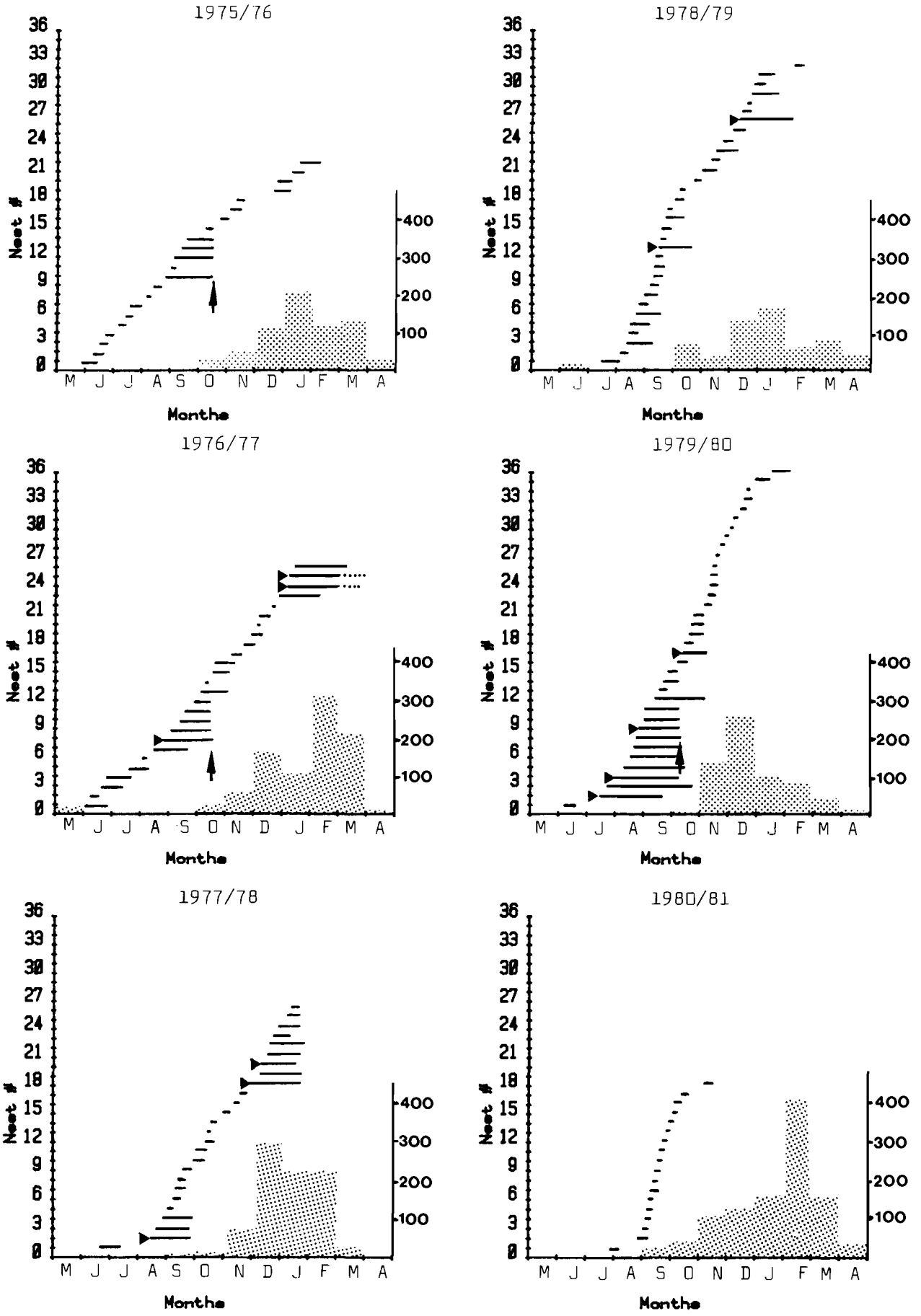

Figure 1 Variation in the number of nests built each season; in duration of season; and in the period of time each nest remained in existence before being destroyed by the male. Periods of 'mass destruction' are arrowed and those nests in which young were produced ▶ indicated. Monthly rainfall (in mm) is shown as shaded histograms.

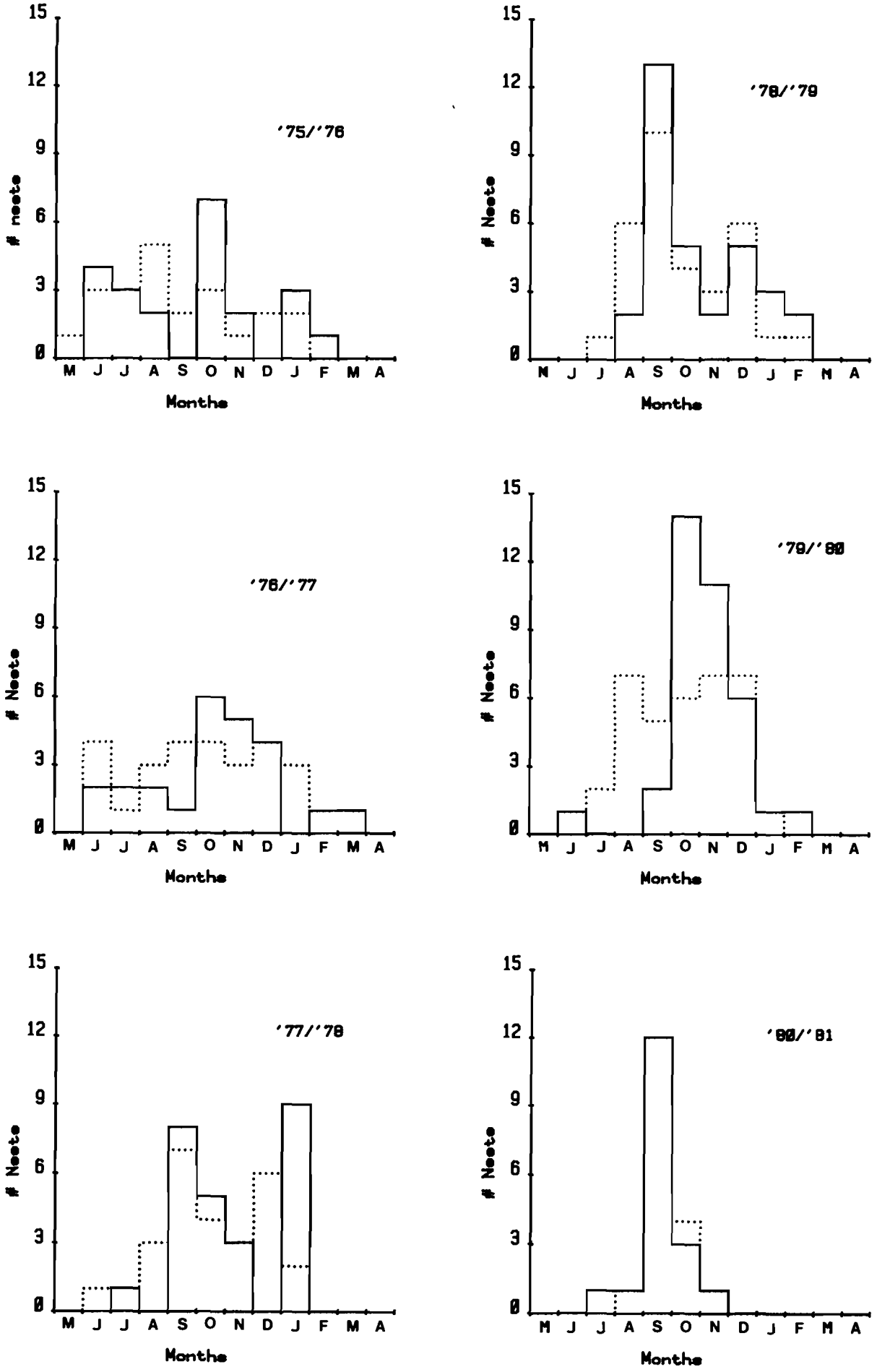

Figure 2 Comparative rates of construction (.....) and destruction (_____) of nests in *P. velatus*.

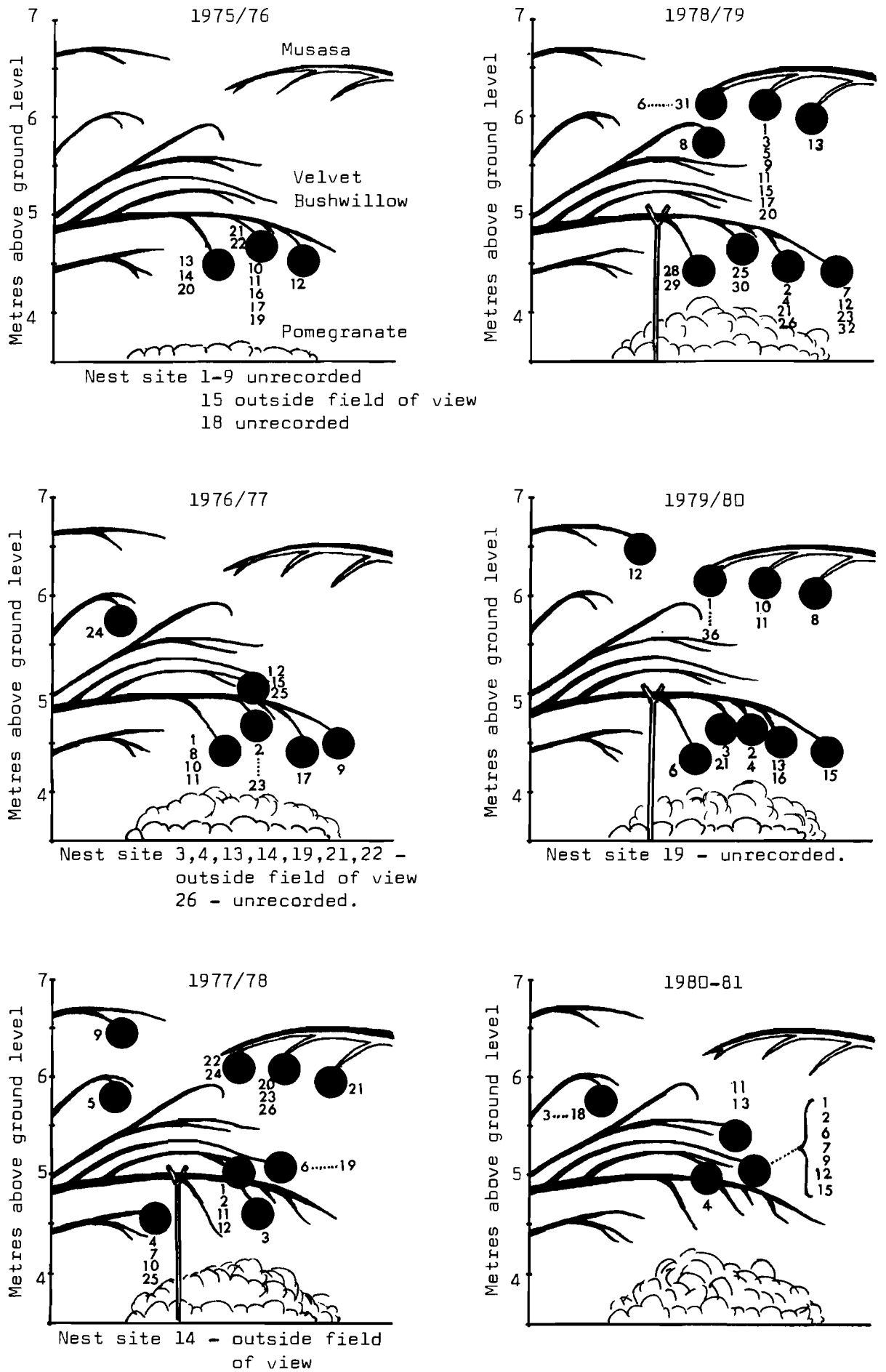

Figure 3 Seasonal variation in nesting height above ground level, and the branches selected for nest construction. The *Combretum* branch was propped up on 11 Dec 1977 (after nest No. 20 was built); and on 22 Oct 1978 (after building nest No. 19 & 20).

Leaf-stripping behaviour

The removal of leaves by the weaver was not by any means restricted to the branches selected for nest construction. Surprisingly, both sexes engaged in this activity although, when compared to the male, leaf stripping by females was infrequently observed. Defoliation of the tree was generally concentrated in an area 2 – 3 m around the nesting site, but also took place elsewhere in the tree. For example, the presence of the bird was often betrayed by a stream of leaves falling from the canopy of the tree, well away from the nest branches themselves. Leaf stripping also occurred in periods between bouts of nest construction and the male was also regularly observed to 'gnaw' at branches with its beak.

Nest construction

Nest construction was carried out entirely by the male. Normally the nest was hung from a single branch, although on occasions two branches or, more rarely, the fork of two twigs were used. Certain exceptions, such as 1/78 (when a branch was incorporated into the floor of the nest) and 18/76 (suspended on strands of grass *ca.* 5 cm below the branch) are noteworthy. Nest materials were generally carried in the beak, although the feet were seen to be used for this purpose as well.

A distinct sequence of events was evident in the process of nest construction. These were:

(i) *'Spiral' phase.* This represented the first step in construction, and comprised one or more strands of grass which were wound around the branch in a corkscrew manner. Their presence denoted that the male had started building.

(ii) *'Stirrup' phase.* Additional blades of grass then became wound into the spiral attachment until two 'stirrups' were formed. The bird stood between these whilst uniting them to form a ring. On occasions (21/78), the stirrup phase can be omitted, but only when long strands of nesting materials were available. These then became directly looped to form a ring without implementing any of the intermediate stages.

(iii) *Ring phase.* Once the two stirrups were joined together to form a ring, the latter functioned as a platform from which the bird could stand or hang whilst building continued. The ring became gradually thickened to form the most critical element of the nest. It influenced the size, the orientation and strength of the structure. It served as the 'scaffold' from which further construction was undertaken, as a lip for the egg chamber and as a 'landing and launching pad' for each flight to and from the nest.

(iv) *Chamber-forming (or 'see-through' phase).* From the ring, building was then directed at forming the floor and roof of the nest which for several days could assume a 'see-through' appearance. This was done by anchoring strands of grass into the ring in such a way that they curved outwards and, in the process, began to assume what would eventually be the kidney-shaped egg chamber. On the opposite side of the ring a canopy was formed which extended downwards until formed into an entrance which was parallel to or horizontal with the ground. The size of the entrance hole was generally *ca* 3,7 cm in diameter but, should a female assume permanent occupation of the nest, became narrowed through the addition of fresh building materials to *ca.* 2,5 cm in diameter. It was interesting to note that, whilst weaving, grass blades were shifted laterally from one side of the beak to the other. The bird could also split blades of grass on site, particularly as it would arrive on occasions with pieces of up to *ca.* 40 cm long and *ca.* 12 cm wide. The see-through nest was often used by the male as a night roost.

(v) *Lining phase.* The chamber-forming phase may, or may not be followed by lining operation. In one case, a nest remained 'see-through' for 20 days before it was lined, but this does not preclude females from taking occupation of such nests. Lining was performed by both the male and female although, as a rule, the former played by far the most active role.

Often feathers (from a nearby fowl-run) were used for this purpose and, on occasions, a female was seen to be retrieving feathers from a nest that the male was in the process of demolishing. The male was also seen trying to rob a female of a feather that she had found for the lining of her nest.

Any nearby source of soft materials (such as young leaves, as also described by Williams (1977), and grass, buds and pampas flower tufts) were used for lining, and in the process a thick downy interior became formed within the nest. In one nest 86 pampas tips were used, but it was impossible to judge when lining operations were really complete. For example, the male would continue to line a nest whenever the occupant female was absent.

The first nest of the season occasionally gave the appearance of being carelessly constructed. However what started out as a ragged structure was often neatly finished. The only nest which developed obvious structural defects was nest 2/81. In this instance a 35-mm hole appeared in the egg chamber through which the lining began to bulge. This was rectified by patching the hole with new strands from outside and by using additional lining material from the inside, and yet, despite such faults, the nest still became occupied (albeit temporarily) by a female. Poor workmanship also became evident at the end of the season, presumably because the building urge was beginning to wane. For example, nest 36/79 came to assume a peculiar shape, having been formed from a clump of woven grass in which the bird had tried to mould the roof by deliberately bumping its head against the ceiling. Despite this, the bird spent a great deal of time on this structure and meticulously finished off the outside.

Collias (1977) recognized three phases of construction in *P. cucullatus.* In *P. velatus* however, the situation was not as clear-cut, and in addition seemed to be a more complicated process (Collias & Collias 1962). This was not only because the male worked on two or more nests at once, but also because there seemed to be no stage at which a nest could be regarded as complete. Although Williams (1977) recorded the completion of a nest within 9 h, and a nest to structural dimensions can and often is built within one day if the male is uninterrupted and materials are nearby, our observations show that the bird may begin construction of a nest and then do no further work on it for up to five days.

On the other hand, during the course of one day it may allocate its time to work on up to four nest structures. Furthermore, the male weaver would tinker with nests even when they were 27 – 36 days old with chicks in occupation, and constantly added to the nest, both internally and externally. Additions of this nature, or intervals in work, showed up green in colour against the older, more weathered nest materials which by then had assumed a brown colouration. The male was most fastidious and often tidied up the nest structure by tucking away or pecking off protruding pieces, and would even apply a second layer of grass around the outside of an otherwise 'completed' nest. During this process the nest attachment point could be reinforced, the nest entrance narrowed, and even a spout added, sometimes up to 5 cm long (e.g. nest 18/79 and 20/79). These observations led to the conclusion that the male masked weaver was an impulsive builder (see Discussion).

Nest destruction

During the study period, nest demolition was as conspicuous as nest construction. The male was responsible for both activities and, during the course of the six year study period, destroyed all but two of the nests it had built or started to build (Table 4). The only nests which were not shredded were two built at the end of the 1976/77 season. These fell off the branches of the tree 'unassisted' in March. The decision to destroy a nest seemed to be made impulsively. A nest would be demolished at any of the aforementioned stages, in fact 52 of the 160 nests did not survive longer than three days. Furthermore, the bird would often switch activity from construction at one nest (23/78) to destruction of another (24/78) all during the course of a few hours. Periods of mass demolition also became evident. For example, in three days of October 1979 (Figure 1) 10 nests were destroyed, many of which had been in existence for more than 35 days. On such occasions new nests were destroyed together with older structures. During a three-month period (September – November inclusive) 63% of the nests built were destroyed and it was not unusual in any one month for the male to destroy more nests than it had built that month (Figure 2).

Table 4 Seasonal variation in the number of nests destroyed by a single male masked weaver during a six year study period

Season	M	J	J	A	S	O	N	D	J	F	M	Total
1975/76	–	4	3	2	–	7	2	–	3	1	–	22
1976/77	–	2	2	2	1	6	5	4	–	1	1	24
1977/78	–	–	1	–	8	5	3	–	9	–	–	26
1978/79	–	–	–	2	13	5	2	5	3	2	–	32
1979/80	–	1	–	–	2	14	11	6	1	1	–	36
1980/81	–	–	–	1	12	4	1	–	–	–	–	18
Totals	–	7	6	7	36	41	24	15	16	5	1	158

In October 1976 a fully lined, 40-day-old nest (7/76) that had been occupied for 25 days by a female up to the night before, was destroyed, and it was not unusual for the male to destroy the nest in which it roosted at night. On occasions the male attended to the destruction of two nests simultaneously.

The technique employed in destroying a nest varied, but normally began by removing the lining from the floor of the nest. The male then hung from the nest whilst stripping away the bottom of the structure. During this time the bird displayed great determination, strength and agility, and the process could be intermittent or non-stop. In demolition the nest was shredded into tiny pieces, each of which generally blew away in the breeze whilst the process was going on, but the male often broke pieces from the nest into even smaller pieces, especially tufts of pampas grass and feathers. These he would take to a nearby branch and tear to pieces using his beak and claw. The male always meticulously examined the area below for any pieces of the nest that may have become lodged amongst branches or undergrowth, and intermittently searched the same area for pieces that may have been overlooked earlier.

On two occasions only were nests removed intact by pecking through the attachment site at the branch. These fell to the ground as whole structures, one of which was picked up and placed in the pomegranate bush below the nest site. It was shredded by the male in the normal manner seven days later.

The dismantling of waterlogged nests (after rain) obviously presented more difficulty to the bird than dry structures, as did nests in which young had been reared. In the latter case the nest lining had become solidified by faeces and in these instances, once freed, the floor of the nest, together with the lining, fell to the ground as a solid lump.

The time taken to destroy a nest varied from 10 to 30 min according to the stage and consequent degree of bonding of the nest structure. On two occasions (3/80; 15/80) the process of demolition was timed to take 21 to 22 min.

Nest-destruction took place regardless of female interest or disinterest in the structure and often culminated in a period of great exuberance and vocalization.

Discussion

Certain of the aforegoing observations and data differ significantly from the observations of Taylor (1946) who studied *P. velatus* in the Eastern Cape (Graaff Reinet) for five seasons (1940 – 1945 inclusive). Although a different subspecies (namely *mariquensis)* to that in Zimbabwe (where *tahatali* occurs), is involved, (Clancey 1980; Irwin 1981) the fact that the two study areas are separated by approximately 1850 km, means that the differences shown can probably be ascribed to climate, in particular the amount and reliability of rainfall as previously noted for *P. velatus* by Brooke (1959). For example, Taylor (1946) showed that in the Eastern Cape '. . . Nesting does not commence until after rains have occurred'. In Zimbabwe the opposite applies. Our observations show that nesting commenced in winter (June) and the height of the season (August/October) occurred during months which characteristically precede the rains. These results agree with Irwin (1981) who gives the egg-laying months in Zimbabwe as July to April, and the height of the egg-laying season as September to February.

However, certain differences noted are not so easily tied to ecological variables such as rainfall. For example, Taylor (1946) found that '. . . the old nests of the previous season are demolished, before building is commenced'. No such observations were made during the course of this study because the male itself destroyed all but two of the 160 nests built, before the end of the season. The two which escaped demolition (at the end of the 1976/1977 season) fell off the branch within a month. Taylor (1946) regarded demolition to be abnormal, and nests being '. . . left intact until the following season' to be normal. The incidence of nest destruction during the present study suggests the opposite.

Taylor (1946) also concluded that '. . . Males do all the nest construction, with the probable exception of the lining'. The results of the present study showed that the male was almost entirely responsible for the lining of nests.

Some of the other areas of apparent dissimilarity could be ascribed to individual variation in behaviour. These were:

— The maximum number of nests in the male's territory at any one time (7 in Taylor's case; 12 in the present case).
— The maximum number of nests constructed during one season (15 in Taylor's case; 36 in the present case).
— That while Taylor found that the breeding urge became fainter at the end of the season, this was not necessarily so in the present study (see Figure 1, seasons 1976/77 and 1977/78 as examples).

Other than this there were many areas of similarity between this account of nest building in *P. velatus* and that of Taylor (1946). Our observations confirmed that the same nest site was used over a succession of years; that only one male was involved; that the leaves at the tips of branches were permitted to project through the top of the nest; that nest demolition was carried out by the male; and that the time taken to complete a nest varied considerably.

The significance of leaf stripping is difficult to explain, but the most likely reason for such activity is to increase visibility around the nesting site. It also seems reasonable to suggest that, like the male's constant 'tinkering' with nests, leaf stripping (in areas other than the nest site) is a form of displacement activity that helps rid the bird of excess energy. The male was also seen to gnaw at branches which, in our opinion, is undertaken to maintain the beak in a functional condition. This is because it is likely that the edges of the beak become worn through constant use, after pulling at, stripping and intertwining the coarse materials (such as pampas-grass leaves) that are used for nest construction.

Nest demolition is another extraordinary bit of behaviour. Although the need to re-use choice nest branches is an obvious explanation as to why the bird engages in such activity, the fact of the matter is that the bird does not necessarily rebuild on the same branch again (Figure 3). The need to shred the nest into tiny pieces also seemed to have immense significance, as did the meticulous search of the area below the nest site to ensure no trace of the nest remained.

The most important single conclusion drawn from the data presented is the realization that the most critical factor controlling breeding success in *P. velatus* is the impulsive behaviour of the male. Other than his role in fertilization, the male's principal contribution to reproduction of the species was in the provision of nests. His duties seemed to revolve around building, lining and maintenance of the nest, as well as proclamation and defence of his territory. The male determined when the breeding season began or ended (for example in 1980 when it began late in June and ended early in November), how many nests are constructed, and for how long they remain in existence. These responsibilities complemented the role of the female which, once permanently resident, was to produce eggs, rear and feed the young. The male never assisted in feeding the brood, as confirmed by Prozesky (1977), whereas a female with young will ceaselessly return to the nest with food, even throughout periods of heavy rainfall.

To gain further insight into this most intriguing aspect, observations on the same weaver group are continuing, but with emphasis being placed on the need to ring as many of the participants as possible. Whilst we are confident that the same male has been involved throughout the study period, it would not be surprising to find that the same females may also be involved, year after year.

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