

Preferential Plant Material Used for Nest Construction by *Pelecanus philippensis* and *Mycteria leucocephala* at Telineelapuram Pelicanry

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Abstract- The present work emphasizes bird nesting ecology pattern with available vegetation surrounding their habitat. A detailed study has been carried out from 2009-2015 at Telineelapuram recognized as Important bird area (IBA-IN-229). The study was carried out for two near threatened birds such as Grey Pelican (or) Spot-billed Pelican (*Pelecanus philippensis*) and Painted Stork (*Mycteria leucocephala*). In this study, plant parts of 28 species of trees, shrubs and grasses were recorded for being utilized while nest building; Grey Pelican were observed to collect 18 plant species and Painted Storks from 20 different plant species. Close observations at the nests revealed variations in the plant species composition, the type of material collected (twig, leaf, inflorescence) from each other. The nests of these two species were identified with variations in size, nesting pattern, and nesting locations.

Key words: *Mycteria leucocephala*, nest building, nesting material, *Pelecanus philippensis*, plant species.

I. INTRODUCTION

Birds prefer the location which affords the necessities of life, food, water, shelter, and reproduction [1,2]. Birds explore their environs for the use of resources in many terms. The rate of exploration intensifies at the time of reproductive phase, for finding mate, for nesting location and for the resources like nest material and food for the offspring when compared to non-reproductive phase [3]. However, the inheritance of the species directs the type of nest with the availability of the suitable nest material. A nest broadly serves two functions- to protect the egg and young from extreme climate and from predators. The role of nest is determined by heredity, raw materials used, the site chosen, the experience and adaptive intelligence of the builder and possibly by imprinting or by simulated [4]. From Arthropods to Mammals many species in animal kingdom build nests for raising their progeny, but aves are best known for their nest design [5]. Depending upon the size of the bird and ability to perch over trees and the frequency of movements at the nest, their nesting locations are selected. Predominantly, arboreal nesting birds select trees as platform for nesting and nests are frequently constructed at the verges of tree branches [4]. Preference of type of nest material depends upon the size and weight of the bird and their choice of nest location on canopy [6]. Nests are often built of materials found in the immediate vicinity [7]. Colonial-nesting species present a special case of site selection in which one bird requires a nest site that is surrounded by nests of other similar birds [8]. Thus, in the case of large birds like Grey Pelican it should be the wider top or open canopy which will be preferred. And the Painted Storks with long and lean legs have the benefit to move over the branches and enable them to construct their nests in the inner columns of canopy, apart from the nests in the top canopy and in the fringes of marginal canopy. The breeding season for birds in the tropical regions starts with the onset of monsoon while the canopy prospers in lush green. One of the eight species of Pelicans, the Grey Pelican (*Pelecanus philippensis*) a near threatened bird has its active breeding grounds distributed in south Indian states – Andhra Pradesh, Tamilnadu, Karnataka and in Assam state of north-eastern India [9,10]. Breeding of Spot-billed Pelican and Painted Storks have been reported from various sites in India [11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37]. Only few studies were conducted about their breeding biology from the nesting corners of the Indian sub-continent [13, 38, 39, 17, 40, 32, 41]. Extensive studies on free ranging Painted Storks at Delhi Zoo, about their nesting ecology, breeding patterns, foraging behaviour were done at Delhi Zoo, North India [42, 43, 44, 45, 46, 29, 47, 48, 49, 50, 16] on differential ethology of Painted Storks and with other storks. The breeding period at Telineelapuram starts from the last week of August with the onset of Northeast monsoon and ends by early May or in the mid of May. This article provides information on plant taxa utilized as nest material and the type of material used for the nest construction by Grey Pelican and Painted Storks.

II. MATERIALS AND METHODS

i. STUDY AREA

Studies were conducted during 2009 to 2015 at Telineelapuram village (18.57°N 84.26°E) in Srikakulam, Andhra Pradesh. Telineelapuram village is spread across 450 acres and includes residential area surrounded by agricultural lands. The study area has a rich tree canopy within the village premises, predominantly contributed by Prosopis, Tamarind, Mango and Ficus. Every year Grey Pelican and Painted Stork nest at Telineelapuram village. The birds utilize the trees in the center of the village for nesting. Given the importance of this place for global conservation of these two species, this location was recognized as Telineelapuram Pelicanry – an important bird area IBA-IN-229 [51]. The study area has nine waterbodies within 1 km radius, Bhavanapadu creek/lagoon at 5 km and is at 8 km radially from the Bay of Bengal coastline (Figure 1). The inland wetlands and brackish lagoon

in the surrounding area serve to be the main source for food. Apart from this Chilka lake, Odisha state at 100 km from the study area is also believed to be the feeding ground [52].

ii. **STUDY SPECIES**

Grey Pelican (*Pelecanus philippensis*) and Painted Stork (*Mycteria leucocephala*) are the two local migratory birds which breed at Telineelapuram pelicanary during the onset of Northeast monsoon. Both the species are locally migratory, large sized, piscivorous, arboreal, colonial nesting and both the species are categorized under Near Threatened [9,10] and are listed under Schedule-IV of the Indian Wildlife (Protection) Act, 1972. Grey Pelican weigh 5 – 7 kg with stout body, short and strong legs with webbed feet. Painted Storks weigh 4 – 5 kg, with long and lean flesh–coloured legs often coated in white with their own guano.

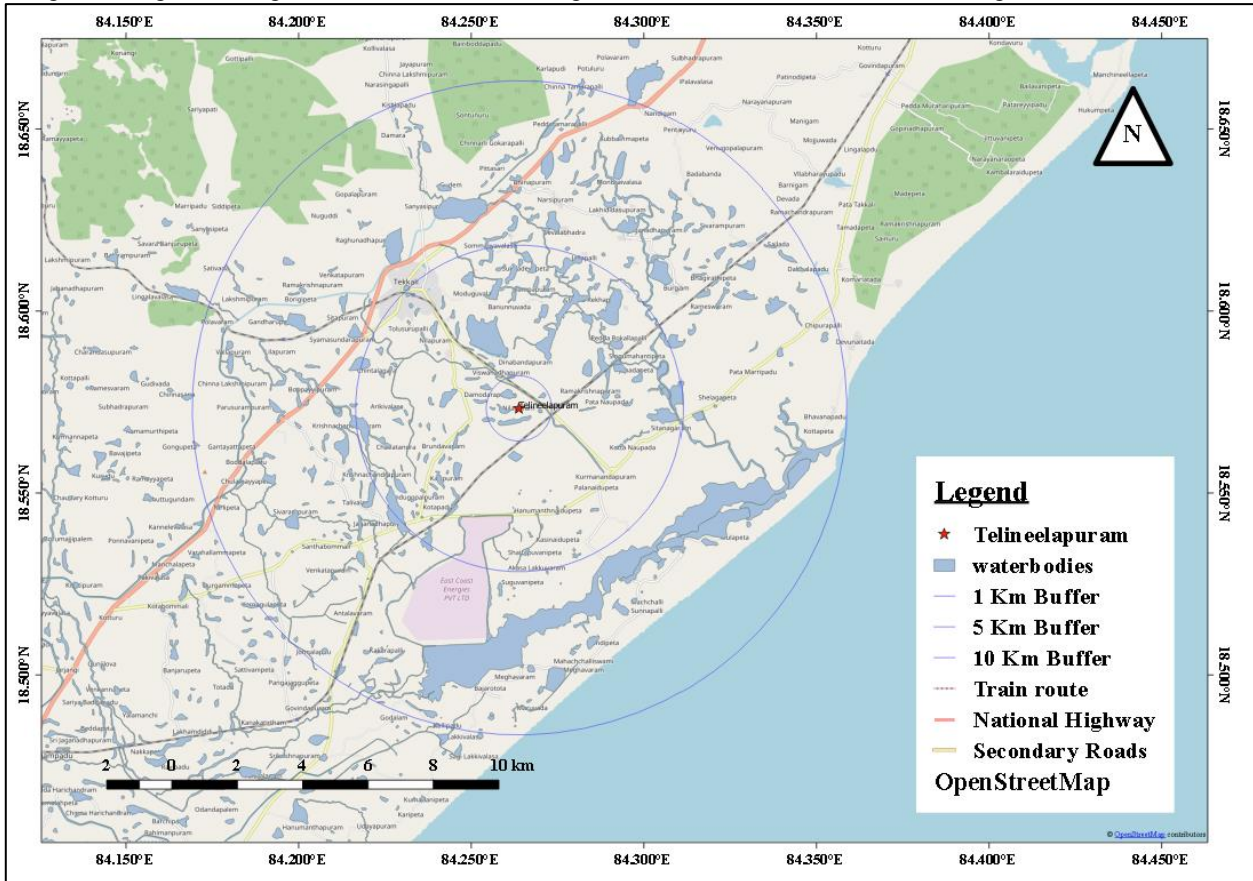


Fig 1: Study area description map – Telineelapuram and surrounding environs

III. METHODOLOGY

The observations were recorded from the watch tower and roof top of the houses in the village as vantage points adjoining the nesting trees. Care was taken not to cause any disturbance to the breeding birds. The type of plant material collected by both the bird species was identified and recorded from visual observations, when the birds bring the material at the nest. The observations were made using a Binocular (7X50) and a digital SLR camera (70-400mm, Telescopic lens, Nikon) was used to photo-document the bird activity at the nest. Photographs were also helpful as reference to identify the plant species.

Initial attempt to measure the nest dimensions at the end of the breeding season was unsuccessful for measuring Grey Pelican nests, as no nest existed by the end of the breeding season. Hence, in the followed by season, the nest dimensions were estimated during incubation stage using a standardized range finder (Nikon, Forestry-500).

IV. RESULTS AND DISCUSSION

Nests of both the species appear different in their structure, shape, size and depends on the choice of nesting location and the preferred type of nest material. Grey Pelicans occupied the top and open canopy with strong branches, so the bird movement is not interrupted by any obstacle. Both the birds collect nest material for the nest construction, males predominantly collected the nest material from the trees in the surrounding, female birds spend more time at nest place and are the architects for the nest construction. The Grey Pelican nest structure appears as a stack of dry woody sticks at the base which are overlaid by the flexible twigs and then green leafy twigs to provide cushion to the eggs and to the incubating birds. The gregarious nesting nature of Pelicans was evidenced from observation, 2–7 nests were built remarkably close to each other, as such the nest material was observed to be shared with the adjoining nests. Thus, the patch of dried nest material, twigs and leaves distinguishably appear like a mat spread on green canopy (Figure 2).



Fig. 2: Mat like appearance of Grey Pelican nests due to the stacked nest material.

(a) Cluster of nests of 5 pairs. (b) Cluster of nests of 3 pairs

Painted Storks nests were observed mostly on the fringes of the canopy. Due to their light weight and long legs, they can move from branch to branch, hence their choice of nesting sites is wide, and few pairs were also found nesting in the inner columns of canopy as well. Among Painted Storks too, both the nest mates collect the nest material, moderately males collect most of the nest material and female construct the nest, including collecting the twigs from the nesting branch. Painted Storks though colonial, are territorial in nature. Hence, unlike as among Pelicans, Painted Stork nests have clearly defined boundaries (**Figure 3**).

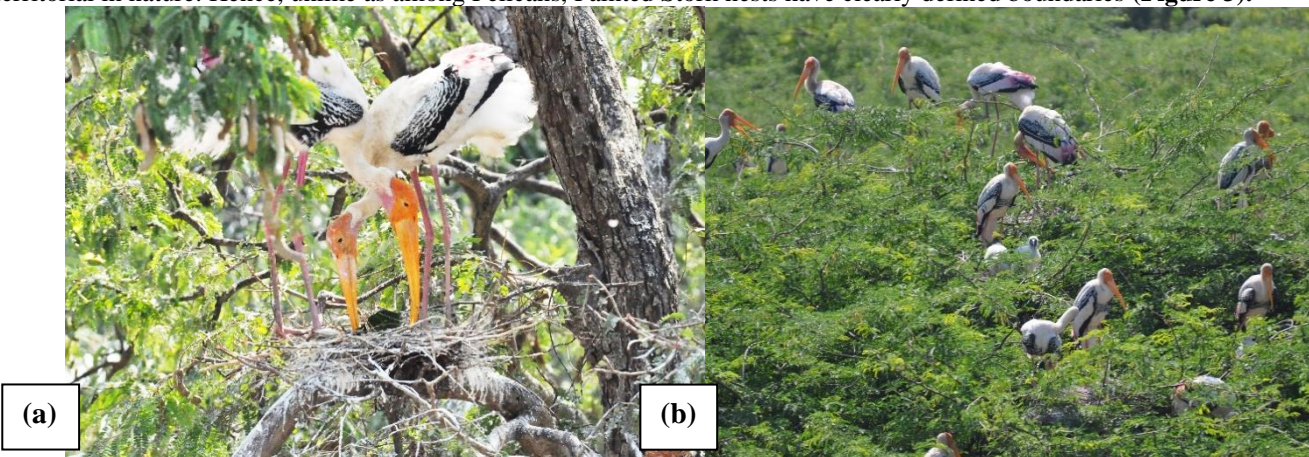


Fig. 3: a. Painted Storks nest constructed in the inner columns of the tree canopy.

b. Distinct nests of Painted Storks.

The size of nest depends on the size of the breeding birds, and it was observed, the Grey Pelican nest has a mean diameter of 51 cm (N= 25) and 45 cm (N=28) for Painted Stork (**Table 1**).

Table 1: Nest dimensions of Grey Pelican and Painted stork

S. No	Name of the species	No. of Samples	Nest Diameter (cm)	
			Mean	Range
1.	Grey Pelican	25	51	46-57
2.	Painted Stork	28	45	42-48

The nest size of both Grey Pelican and Painted Storks are smaller to the body length i.e., the nest area provides space to accommodate eggs and the abdomen of the birds. So, observations were made to record how the birds accommodate themselves in the nests. Grey Pelican rests the base of their necks on the outer edge of the nest and rested their neck length, head and bill folded on to their backs and the tail feathers left out of the nest. Wings were observed to be folded close to the body and often seen partly unfolded and resting on the nest edges and are also observed to press the partly unfolded wings against nest edges to make space to fit in. The Grey pelicans were observed to partly unfold the wings and make a cover to defend against the pilfering of nest material by the neighboring pairs (**Figure 4**). Grey Pelicans were observed to incubate the eggs positioned partly covered by the webbed feet and abdomen covering the rest of the eggs and feet (**Figure 5**). Schreiber^[53] described that Brown Pelicans incubate with their totipalmate feet covering the eggs. Nagulu^[38] during his studies at Nelapattu expressed the possibility of incubating through totipalmate feet as Grey Pelicans lacks brood patch.



Fig. 4 (a, b): Sitting position of Grey Pelican to prevent plifering of the nest material



Fig. 5 (a, b): Grey Pelicans incubate their eggs positioned under the totipalmate feet

When compared to Grey Pelican, Painted Stork nests are small and oval shaped and fine woven by accommodating the soft twigs of the nesting tree along with the collected material which makes the nest adhere to the location. Among Painted Storks, initially the base of the nest is laid, and the female bird occupy the nest base and lay eggs and conceals for incubation. Males continue to complete the nest construction process, by lining around the female to provide the cup shape to the nest and the female in the nest also makes orientation to give the nest oval shape (Figure 6). The nest space is occupied from the base of neck to the abdomen region, the length of neck and head are observed to be folded back and lay rested on their back or are seen raised. The tail is left extending outside of the nest. The Painted Storks, in the shallow cup shaped nest, position the eggs in between their two legs and rest their abdomen to cover the eggs and incubate.



Fig. 6 (a, b): Male Painted Storks assemble the nest material while female occupy the nest floor to raise the edges of nest.

Plant materials from 28 plant species belonging to 17 families were utilized as nest material by Grey Pelicans and Painted Storks (Table 2). Grey Pelicans were recorded collecting 18 plant species belonging to 13 families for nest construction and that included dry, woody material to lay the base of nest, leafy twigs, and inflorescence material as another layer for cushion. Of the 18 plant varieties, Pelicans were recorded to collect 14 terrestrial plant species, three aquatic weeds and grasses from the nearby waterbodies (Figure 7).

Table 2: List of plant taxa and type of material preferred for nest construction.

S. No	Family	Name of the Plant species	Grey Pelican	Painted Stork
1	Anacardiaceae	<i>Mangifera indica</i>	T _d , T, L	–
2	Asteraceae	<i>Vernonia cinerea</i>	–	T
3	Bambuseae	<i>Bamboosa sp</i>	L	T
4	Bignoniaceae	<i>Tecoma stans</i>	–	T, I
5	Combretaceae	<i>Terminalia arjuna</i>	T _d , T, L	–
6	Convolvulaceae	<i>Ipomoea carnea</i>	T	–
7	Cucurbitaceae	<i>Coccinia grandis</i>	–	L
8	Fabaceae	<i>Cassia marginata</i>	–	T
9	Fabaceae	<i>Leucaena leucocephala</i>	–	T
10	Fabaceae	<i>Mimosa pudica</i>	–	T
11	Fabaceae	<i>Peltophorum pterocarpum</i>	T, L	–
12	Fabaceae	<i>Pongamia pinnata</i>	T	T
13	Fabaceae	<i>Prosopis chilensis</i>	T	T
14	Fabaceae	<i>Samanea saman</i>	T _d , T, L	–
15	Fabaceae	<i>Tamarindus indica</i>	T _d , T	T
16	Fabaceae	<i>Tephrosia purpurea</i>	–	T
17	Lamiaceae	<i>Tectonia grandis</i>	T, I	T
18	Malvaceae	<i>Abutilon indicum</i>	–	T
19	Malvaceae	<i>Pavonia odorata</i>	–	T
20	Malvaceae	<i>Sida acuta</i>	–	T
21	Moraceae	<i>Ficus benghalensis</i>	T	T
22	Moraceae	<i>Ficus macrocarpa</i>	T	T
23	Myrtaceae	<i>Eucalyptus indica</i>	T, L, I	–
24	Poaceae	<i>Saccharum spontaneum</i>	L	–
25	Rhamnaceae	<i>Ziziphus mauritiana</i>	T	T
26	Rubiaceae	<i>Morinda pubescens</i>	T, L	T, L
27	Sapindaceae	<i>Sapindus emarginatus</i>	T, L	T, L
28	Typhaceae	<i>Typha angustifolia</i>	L	–

Note: “–” = Not used; T_d= dry woody sticks, T= twig, L= leaves, I= inflorescence.

Grey Pelicans were observed to collect nest material from certain locations of the study area which occur in the peripheral which is shown in the map below (**Figure 8**) and the observations had recorded these areas as mango orchards and wooded country (**Figure 9**). Studies by Neelakandan ^[13], briefs about the type of plant material being utilized by the birds to construct their nests are collected from the agricultural fields, waterbodies, and canals. Nagulu ^[38] at Nelapattu, reported 21 plant species and the type of material being collected and utilized by Grey Pelican and recorded that the plant material was fetched from the scrub jungles adjoining the waterbody.



Fig. 7: Collage of images of Grey Pelicans collecting different type of plant material of different species as nest material.

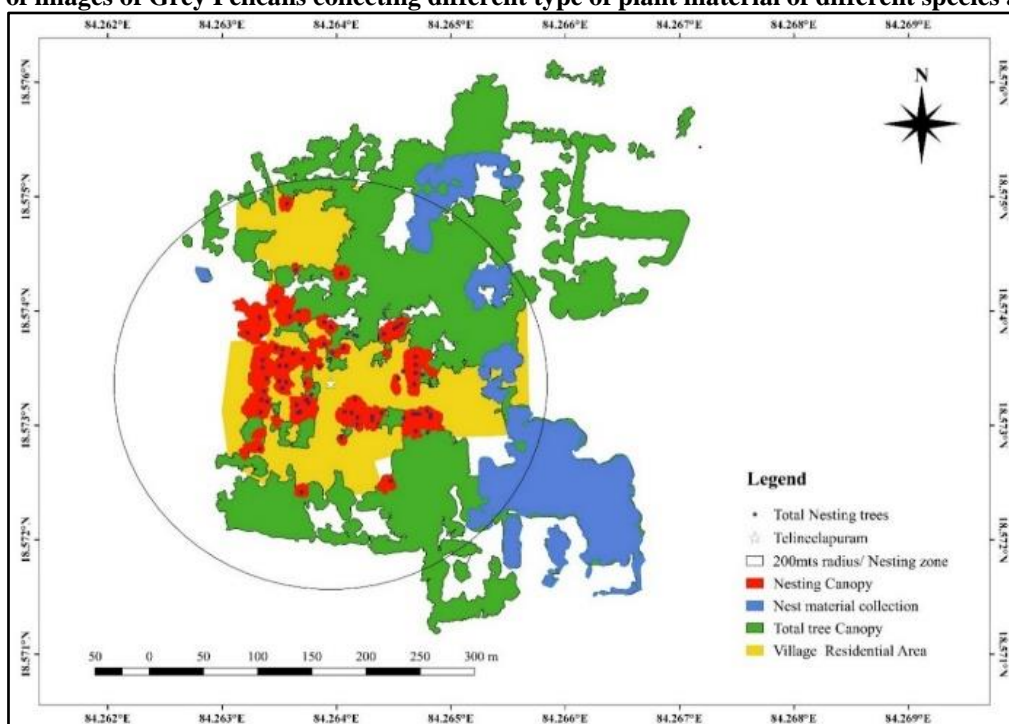


Fig 8. Map describes the extensive spread of canopy (green) and distinctly marked canopy (blue) predominantly utilized for collecting nest material from the study area.



Fig 9. Intensive nest material collection by Grey Pelican at mango orchards at study area.

The purpose of a Pelican nest is served only till the hatchlings grow old enough to balance and perch on the tree branch, it was observed the growing fledgling pull-off the nest material underneath their feet to perch resulting in dismantling of the nest. The dry sticks that fell from the treetops were observed to get worn-out, as a result we could not evaluate the details about the actual length and weight of the nest material as it is procured but the diameter varied from 3mm to 3.5cm. Nagulu^[38] mentioned the size of the material (dry stick) varied from 05 to 150 cm with very thin to 03 cm width and weight of the individual stick varied from few grams to 550 gm.

Painted Storks were recorded to collect nest material from 20 plant species belonging to 12 families (**Table 2**) and (**Figure 11**). The type of nest material included leafy and soft twigs and climbers which are flexible in molding and binding. Painted Storks were observed landing in the village premises for plucking herb species (**Figure 12**). Nest for Painted Storks serves as a platform for providing shelter, and place for the chicks to be served with food and water by the parent birds. A perfectly molded nest of Painted Stork was used till the end of the breeding season; till the new offspring can find food by themselves and parent bird does not need a nest to regurgitate the fish caught to feed them at.



Fig. 11: Collage of images — Painted Storks collect different plant species as nest material.



Fig. 12: Painted Storks recorded in the village premises to collect dry shrubs for nest construction.

Grey Pelican and Painted Storks both the individuals in a pair deliver services to the hatchlings at the nest constantly in maintaining the nest sanitation during brooding period. The leafy material layered on the nest floor provides cushioning and retains the warmth to the eggs under incubation and to the hatchlings at nest. Among both species, the eggs hatch out to nidicolous hatchlings, which are taken care of by the parent birds by providing warmth, food, and protection. Parent birds maintain the nest sanitation by removing the fecal material of hatchlings from the nest floor by removing the leafy material which covers the nest floor. Thus, the leafy material is replaced periodically.

V. CONCLUSION

Both the species were observed to utilize tree canopy in a stratified manner for nesting, Grey Pelicans observed to utilize top and open canopy with strong branches. Painted Storks have a wide choice to select nesting locations compared to Grey Pelicans, they are recorded for nesting in the margins of tree canopy, in the columns of tree canopy and the open canopy.

The list of plant species preferred by Grey Pelican for nest construction varies from place to place; Neelakandan [13] observed and enlisted few plant species in studies at Kolleru which are different from Nelapattu, enumerated by Nagulu [38]. The plant material recorded in the above studies varies from the list of plant species recorded at Telineelapuram. Subsequently, it can be said that the

selection of plant material is dependent on regional availability of the species and is structural dependent; dry-hard-woody for base and structure of the nest, the soft leafy material for cushioning and nest floor.

Telineelapuram Pelicanry has vast tree canopy including the nesting trees and has underneath scrub to find good enough dry, hard, and leafy material for both the nesting species in getting required nest material. As per the studies, 28 species of plants were used for nest construction including the material from nesting tree species. It is necessary to safeguard such intense nest material collecting locations for the long-term sustainability of this pelicanry.

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