

Litter Fall of a Mangrove Species *Avicennia marina* (FORSK) VIERH. at Iriomote Island, Okinawa

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1. Introduction

Mangrove litter is a source of energy for marine organisms existing in water adjacent to mangrove habitats (LUGO & SNEDAKER, 1974; Van der VALK & ATTIWILLY, 1984). In some cases, the mangrove litter become an important primary producers in estuarine food chains leading to commercial fisheries (ODUM & HEALD, 1975). Litter production in mangrove forests have been reported by GOLLEY et al. (1962), LUGO & SNEDAKER (1975), GOULTER & ALLAWAY (1979), WOODROFFE (1982) and HARDIWINOTO (1989). This study was carried out on the mangrove stand of *Avicennia marina* in the Iriomote Island to estimate their litter fall.

2. Materials and Methods

The litter fall was measured for twelve months by using 15 litter traps which are baskets constructed by a square frame of plastic pipe (the mouth of every trap was 0.25 m² in area) (POOL et al., 1975). The traps were placed under trees randomly with a reference to the tide levels at such heights that they be not flooded with water even at highest water level (KHAFAJI et al., 1991). The traps were hanged at about 1.2m above ground surface. The litter was collected from the traps monthly, and then the material was oven-dried for 3 days at 90°C to constant weight. The dried material was separated into leaves, branches, twigs, flowers, fruits and other materials before weighing.

3. Results and Discussion

The litter fall was collected in the period of August 1993 to July 1994. Table 1 shows the dry mass of all material, including leaves, branches, twigs, flowers, fruits and other materials. The litter fall of the *Avicennia marina* Community was estimated as 57.89g/m²/mo. or 6.95 ton/ha/yr composed of leaves (58.5%), branches (10.9%), twigs (4.8%), flowers (2.0%), fruits (3.9%) and other materials (19.9%). The average monthly litter fall is shown in Fig. 1. It is evident that the annual cycle of litter fall begins to rise in June with a peak in August. Litter fall was least in November. There was very little litter fall during the months of December and January. Thus, leaf fall (Fig. 2)

was lowest at the beginning of the winter season and increased gradually in warmer months. The branch fall (Fig. 3) was lowest in September, October, increased monthly was stabilized and began to rise in May till reaching the peak in August. The twig fall had a similar pattern as branch fall. The lowest volume was during the winter months, increasing till reach their peaks in August (summer). Flower fall (Fig. 4) was found to be from May to September, with the maximum in June and July. The fruit fall (Fig.4) was occurred during the month of August to December. The highest fruit fall of *Avicennia marina* was in September when the fruits had matured. The other material was mainly composed of; materials of some insects, crustacean and animal debris, etc. Seasonality in litter fall has been observed in other mangrove species elsewhere. The greatest litter fall has been reported as occurring in summer (GILL and TOMLINSON, 1971). Our results support this finding and those of others (Table 2) with few exceptions. Although the seasonal fall pattern are nearly the same, the amount of litter differ widely from year to year (HARDIWINOTO, 1989).

References

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Table(1) Monthly Changes of Litter fal in *Avicennia marina* Community (g/m^2)

Month	Leaves	Branches	Twigs	Flowers	Fruits	O.M	Total	%
AUG 93	87.31	24.67	9.72	1.33	4.81	8.86	136.7	19.7
SEP 93	41.22	0.32	5.98	0.08	16.88	9.39	73.87	10.6
OCT 93	18.99	0.28	2.88	0	4.57	9.84	36.56	5.3
NOV 93	11.66	2.28	0.95	0	0.9	8.06	23.85	3.4
DEC 93	19.69	1.81	1.73	0	0.1	6.72	30.05	4.3
JAN 94	22.63	1.75	0.78	0	0	5.57	30.73	4.4
FEB 94	28.61	2.24	0.62	0	0	4.52	35.99	5.2
MAR 94	35.45	2.65	0.32	0	0	3.78	42.2	6.1
APR 94	54.3	2.03	0.7	0	0	6.86	63.89	9.2
MAY 94	31	2.12	2.092	2.108	0	13.2	50.52	7.3
JUN 94	14.44	15.84	3.12	5.68	0	9.6	48.68	7
JUL 94	40.8	19.52	4.744	4.764	0	51.76	121.59	17.5
Total	406.1	75.51	33.64	13.962	27.26	138.16	694.93	100
%	58.5	10.9	4.8	2	3.9	19.9	100	

O.M.:other materials

Table (2) *Avicennia* SP. Litter fall at assorted areas in the World

Species	Location	Latitude	Litter Production (dry t/ha/year)	Source
<i>Avicennia germinans</i>	Florida U.S.A.	26°N	6.50	Lugo & Snedaker 1975
<i>Avicennia marina</i>	Ras hatiba Saudi Arabia	22°N	7.78	Saifullahet. al 1989
<i>Avicennia marina</i>	Okinawa Japan	24°N	6.95	This study
<i>Avicennia marina</i>	jizan Saudi Arabia	17°N	12.13	Khafaji et. ai 1991
<i>Avicennia</i> SP.	Hinchinbrook Isl Queens Land Australia	18°N	8.01	Duke et.al 1981
<i>Avicennia marina</i>	Mgeni estuary South Africa	30°N	9.67	Steinke Un published
<i>Avicennia marina</i>	Roseville N.S.W Australia	34°N	5.80	Goulter & Allaway 1979
<i>Avicennia marina</i>	Aukland New Zealand	37°N	8.10	Woodroffe 1982
<i>Avicennia marina</i>	Westem Port Bay Victoria Australia	38°N	2.00	Clough & Attiwill 1975 Unpublished

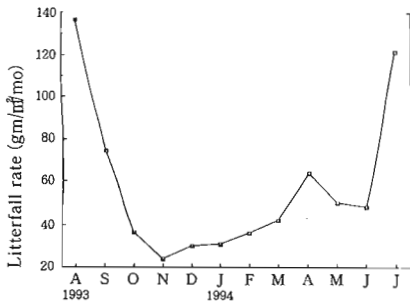


Fig (1) Monthly Change of Litterfall in *Avicennia marina* Community at Iriomote Island

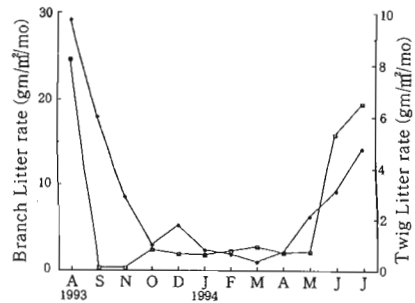


Fig (3) Monthly Change of Brance and Twig Litter in *Avicennia marina* Community

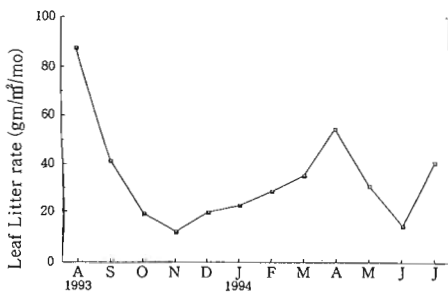


Fig (2) Seasonal Change of *Avicennia marina* Community Leaf fall

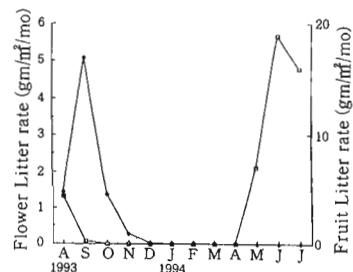


Fig (4) Seasonal Change of *Avicennia marina* Community Flower and Fruit Litter