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The Sciaenid fishery resources off Kakinada, Andhra Pradesh

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Abstract

This paper presents the trend of Sciaenid fishery off Kakinada during the period 1990-99 with a brief description of the species represented. The annual average landing of the group in trawl was 1726t (36 kg/E; 2.5 kg/hr.) contributing to 6.3 % in the total marine landings at Kakinada.The fishery is exposed to high fishing pressure as evidenced by a decline in the catch and catch rate with an increase in effort over the period. Seasonally, peak landings were obtained during January/February and during August to November. *Otolithus ruber* (12%) followed by *Johnius carutta* (11.6%) were the major species represented in the trawl landings. In gill net, the annual catch of 44 t was represented by *Protonibea diacanthus* (51%) and *Nibea soldado* (36.2%). Peak landing was obtained during March, June and December in gill net. A total of 17 species belonging to 11 genera were represented in the landings. The important identifying characters of the species are described.

Introduction

The sciaenids (Croakers, Drummers or Jew fishes) occupy a position second to prawns in abundance in trawl landings at Kakinada (16° 35' -17°25 'N, 82 °20' -83° 10 'E) in Andhra Pradesh (Muthu *et al.*, 1977). Though much work has been done on the fishery, biology and stock assessment of this group of fishes off Kakinada, (Muthu *et al.*, 1977; Narasimham *et al.*, 1979; Murthy, 1980, 1985, 1987; Anon, 1981; Rao *et al.*, 1992; Murthy and Ramalingam, 1996; Chakraborty *et al.*, 2000), there is no information available on the recent trends in the fishery of sciaenids. Further, notwithstanding its significance as a major demersal fishery, there remains considerable ambiguity regarding the systematic position of these fishes. This paper is, therefore, an attempt on the recent trend in the sciaenid fishery off Kakinada with particular reference to the field identifying characters of the species contributing to the fishery.

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Material and methods

Fishery particulars of sciaenids landed

by trawl at Kakinada Fisheries Harbour were collected for the period 1990-1999 from the survey data of Fishery Resources Assessment Division of CMFRI. Gill net landings of sciaenids at Kakinada were also studied for the year 2001 from Dhummulipeta landing centre. Morphological characters of different species were examined based on weekly samples collected from both the gears. A total of 10 to 15 specimens in each species were measured for the morphological characters. Measurements on Head Length (HL), Depth of body (DOB) and length of IInd Anal fin spine (II AFS.) were converted as % of Standard Length (SL). Eye Diameter (ED) is presented as percentage of HL.

Results

Trawl fishery

The annual average catch of sciaenids at Kakinada Fisheries Harbour during 1990-99 period was 1726 t (36 kg/E) at an average effort of 48,759 units. The average landings of sciaenids indicated an increase from 1,088 t during 1990 to 2,692 t during 1992 thereafter showing a general declining trend with marginal fluctuations. The average CPUE recorded was 36 kg/E with peak catch rate of 55.6 kg/E obtained during 1992 at an effort of 48,463 units. During 1993, it is evident that both catch and C/E declined with an increase in effort to 50,249 units. During the subsequent years also, in spite of the effort input being on the higher side, the C/E declined to a minimum of 24.7 kg/E during 1998. (Table 1)

Since voyage fishing also is in vogue off Kakinada, catch/hr (kg) is also taken into consideration with a view to get a better picture of the catch abundance. It may be seen that the C/hr was the maximum of 4.3 kg/hr during 1991 with a total sciaenid

Table 1. *Catch particulars of Sciaenids landed by trawl at Kakinada during 1990-99*

Years	Sciaenid landings(t)	Effort (units)	Effort (Hours)	C/E(kg)	C/hr(kg)	Total marine landings(t)	%Sciaenids
1990	1088	34184	367421	31.80	3.00	13610	8.00
1991	1905	38623	444910	49.30	4.30	17044	11.18
1992	2692	48463	657620	55.60	4.10	25730	10.46
1993	2411	50249	780387	48.00	3.10	30977	7.78
1994	1652	51120	953822	32.30	1.70	29119	5.67
1995	1730	47820	1019327	36.20	1.70	33328	5.19
1996	1254	45988	759957	27.30	1.70	28397	4.42
1997	1631	56263	982408	29.00	1.70	32748	4.98
1998	1578	63989	990110	24.70	1.60	37647	4.19
1999	1315	50887	791375	25.90	1.70	25799	5.10
Average	1726	48759	774734	36.01	2.46	27440	6.30

catch of 1,905 t. During 1992, it is seen that with an increase in effort to 657620 hrs, the catch reached a peak of 2,692 t but with a reduced C/hr of 4 kg. During the subsequent years, both catch and catch/hr declined with increase in effort showing that the fishery is exposed to higher fishing pressure.

The sciaenids contributed to an average of 6.3% of the total marine landings by trawl at Kakinada during the study period.

Seasonal abundance: It is obvious that the C/hr was higher during 1990-93 period which indicated two peaks; a minor one during February/March and a major one during August/September period (Fig.1). However, during the subsequent years between 1994-99, there had been a general decline in the C/hr with the peaks during February/March and during September/November months.

Species composition: A total of 17 species of sciaenids belonging to 11 genera were landed at Kakinada Fisheries Harbour by trawl. *Otolithus ruber* (12%) followed by *Johnius carutta* (11.6%) were the major species represented in the catches. Other important species obtained were *Nibea maculata* (9.6%), *Johnius belangerii* (8.8%), *Dendrophysa russelli* (7.5%) *Pennahia macrophthalmus* (6.6%), *Johnieops vogleri* (6.3%), *Johnius dussumieri* (6.0%), *Protonibea diacanthus* (5.9%), *Kathala axillaris* (5.5%), *Johnieops macrorhynus* (4.8%), *Chrysochir aureus* (4.2%) and *Atrobucca nibe* (3.8%). Other species such as *Nibea soldado* (2.9%), *Johnieops sina* (2.4%), *Panna microdon* (1.2%) and *Johnius macropterus* (0.9%) were of lesser ocurrence. (Fig.2A)

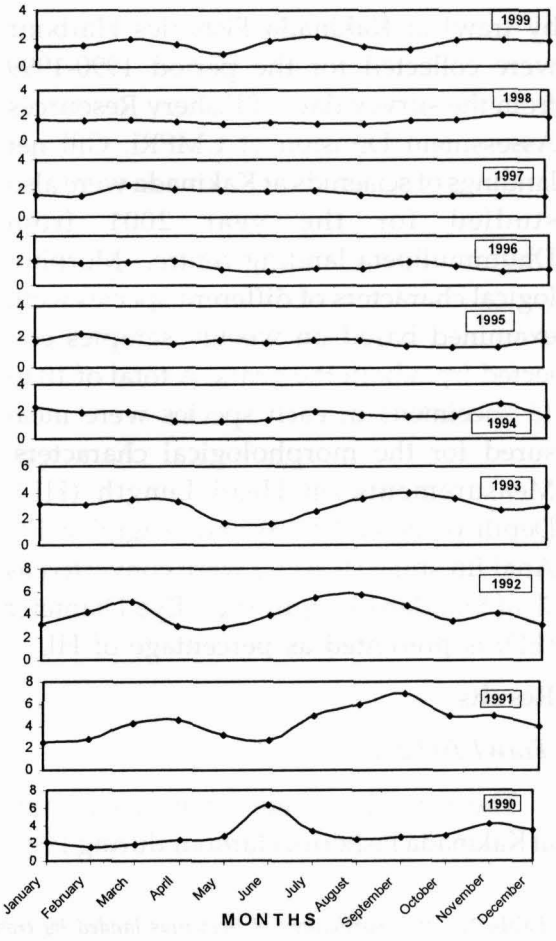

Fig.1. *Seasonal abundance (Kg/hr.) of Sciaenids landed at Kakinada during 1990-99*

Gill net Fishery

The total sciaenid landings in gill net during 2001 amounted to 44 t. at an effort of 15,756 units with a CPUE of 2.8 kg (Table 2).The catch of sciaenids contributed to 3.3% of the landings in the gear.

Table 2. *Catch particulars of Sciaenids landed by gill net at Kakinada during 2001*

Month	January	February	March	April	May	June	July	August	September	October	November	December	Total
Units	1087	1332	1354	1335	894	1383	1259	1327	1354	1426	1390	1615	15756
Sciaenid catch (t)	2.637	6.985	4.798	2.436	1.597	6.639	2.967	1.783	3.66	3.305	2.407	5.239	44.453
C/E(Kg)	2.4	2	5.2	1.8	1.8	4.8	2.4	1.3	2.7	2.3	1.7	3.2	2.8
All fish Catch (t)	79.147	156.635	118.61	148.74	87.009	114.1	87.721	159.98	82.509	69.109	125.897	119.471	1348.9
% of Sciaenids	3.33	4.46	4.05	1.64	1.84	5.82	3.38	1.11	4.44	4.78	1.91	4.39	3.30

Seasonal abundance : Peak landings of Sciaenids in gill net were during March, June and December (Table 2)

Species composition: *P.diacanthus* (51%) followed by *N.soldado* (36.2%) and *J.vogleri* (10.9%) were the major species landed with *O.ruber* (2%) occurring in the catches. (Fig.2B).

The important identifying characters of the major species landed are given in Plate1, Fig 3a-q and 4 a-q.

Atrobucca nibe **(Jordan & Thompson)**

Depth of the body is 27.5–29 % in SL, snout pointed, mouth terminal, lower jaw projected, teeth well differentiated in both jaws, no canines, HL 32-34%, ED. 22-26%, gill rakers in the lower limb of the I[st] gill arch 10-11, II [nd] AFS 6 -7%; sagitta oblong, head of tadpole shaped impression lying vertical to that of the otolith and the tail with a distinct posterior groove and bent distally (Fig.3a). Swim bladder carrot shaped with 26 pairs of arborescent appendages, each with a dorsal and a ventral limb, none entering the head (Fig.4a). Colouration: Lining of the mouth, gill chambers and body cavity black (Fig. 5).

Chrysochir aureus **(Richardson)**

Body slender, DOB 24-30% in SL, snout overhanging the lower jaw, mouth large, inferior, teeth well differentiated in both jaws, 2 pairs of canines in the upper jaw, no barbels, HL 28-30%, ED 17-29%, gill rakers in the lower limb of first gill arch 8-

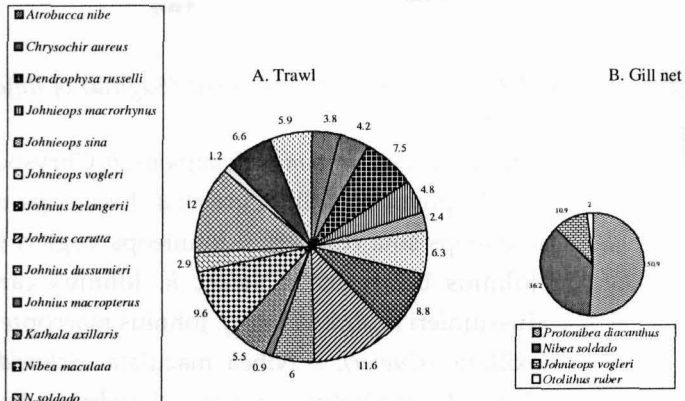

Fig.2. *Species composition (%) of Sciaenids landed in (A) trawl during 1990-99 and (B) Gill net during 2001.*

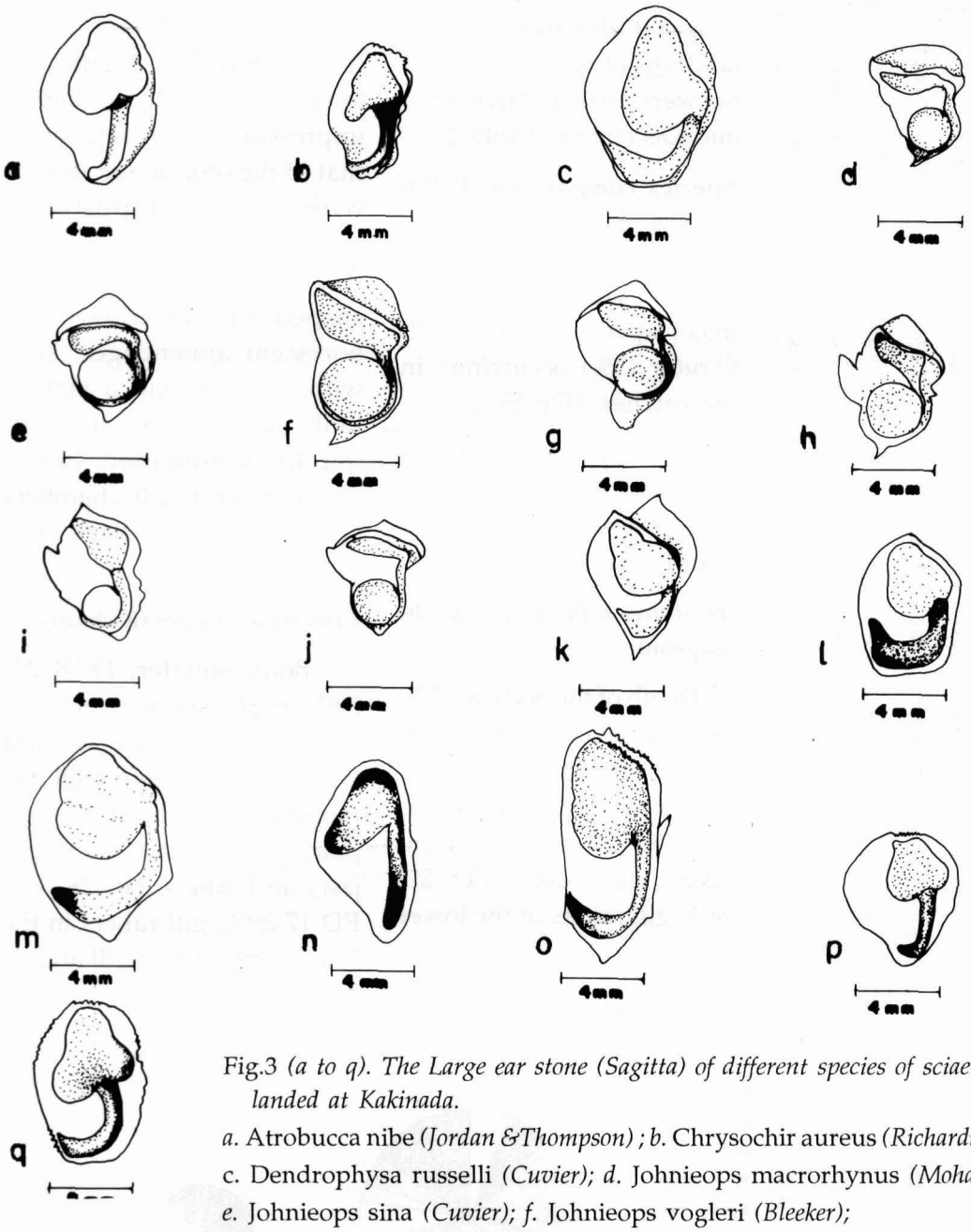

Fig.3 *(a to q). The Large ear stone (Sagitta) of different species of sciaenids landed at Kakinada.*

a. Atrobucca nibe *(Jordan &Thompson)* ; *b.* Chrysochir aureus *(Richardson)*

c. Dendrophysa russelli *(Cuvier); d.* Johnieops macrorhynus *(Mohan)*

e. Johnieops sina *(Cuvier); f.* Johnieops vogleri *(Bleeker);*

g. Johnius belangerii *(Cuvier); h.* Johnius carutta *Bloch; i.* Johnius dussumieri *(Valenciennes); j.* Johnius macropterus *(Bleeker); k.* Kathala axillaris *(Cuvier); l.* Nibea maculata *(Schneider); m.* Nibea soldado *(Lacepede); n.* Otolithus ruber *(Schneider); o.* Panna microdon *(Bleeker)*

p. Pennahia macrophthalmus *(Bleeker); q.* Protonibea diacanthus *(Lacepede)*

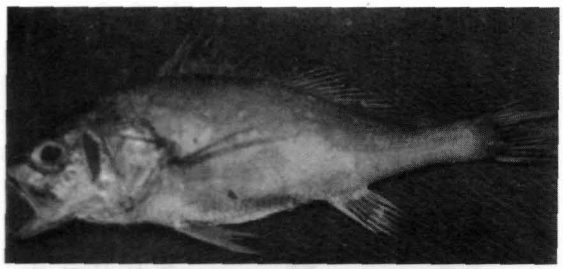

Fig. 5. *Atrobucca nibe* (Jordan &Thompson)

9 (Ist 4 stumpy), IInd AFS 5-7%, sagitta elongate, head of tadpole shaped impression distinct, tail only slightly curved (Fig.3b). Swim bladder with broader anterior end with 28 pairs of arborescent tubules, none entering the head (Fig.4b). Colouration: Fins yellowish to orange (Fig. 6).

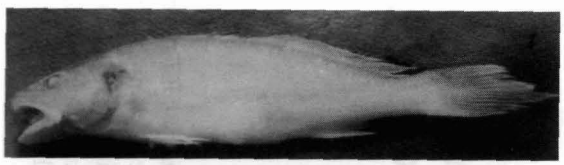

Fig. 6. *Chrysochir aureus* (Richardson)

***Dendrophysa russelli* (Cuvier)**

Body oblong, dorsal profile arched, DOB 27-34%, snout projected, mouth inferior, lower jaw with a single filiform barbel, HL 28-31%, eyes large, ED 23-37%, teeth differentiated into large and small in the upper jaw only, villiform in the lower jaw, no canines. Gill rakers in the lower limb of first gill arch 10 (Ist 6 stumpy) II nd AFS strong 10-15%. Sagitta: broad anteriorly with the tail of the tadpole shaped impression bent forming an acute angle (Fig. 3c). Swim bladder carrot shaped with 15 pairs of arborescent appendages, the first pair entering the head (Fig.4c). Colouration: a dark brown band on the nape, opercle with a deep blue blotch, spiny portion of the dorsal fin black edged (Fig. 7).

***Johnieops macrorhynus* (Mohan)**

Depth of body 27-33%, snout prominent projecting like a hood over the mouth, teeth differentiated into larger and smaller in the upper jaw with the larger teeth closely set while in the lower law there is an inner series of slightly enlarged teeth and an outer series of villiform teeth, no canines, HL 24-31%, eyes large and diameter 22-31%, gill rakers in the lower limb of the first gill arch 5-8 (short and stumpy), IInd AFS weak 6-9%. Sagitta: the head of tadpole shaped impression lying parallel to the broad anterior end, the tail ending in a deep cone (Fig.3d). Swim bladder hammer shaped with 14 pairs of arborescent appendages (Fig.4d). Colouration: Pectoral, pelvic and anal fins yellowish (Fig. 8).

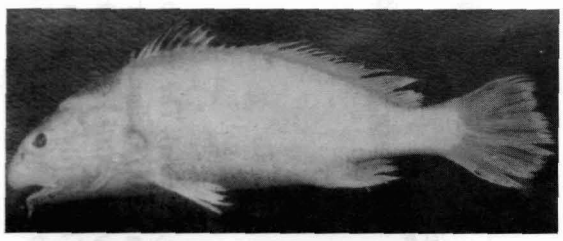

Fig. 7. *Dendrophysa russelli* (Cuvier)

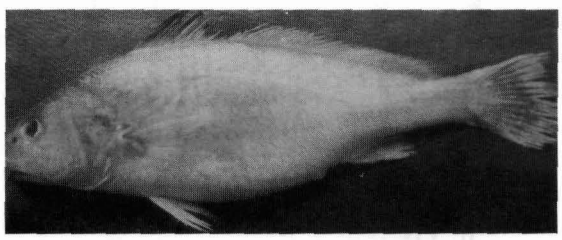

Fig. 8. *Johnieops macrorhynus* (Mohan)

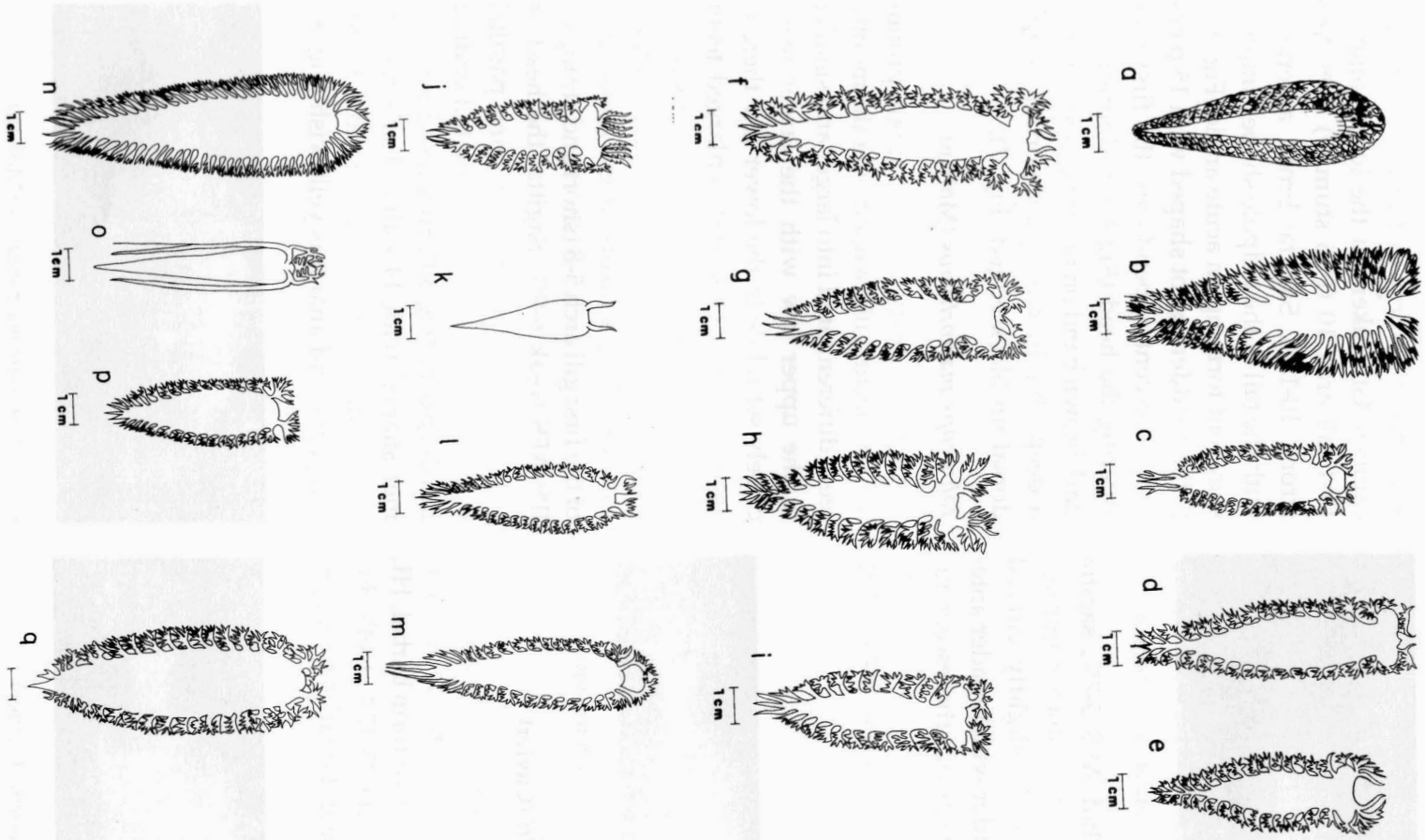

Fig.4 (a to q). *The swim bladder of different species of sciaenids landed at Kakinada. a.* Atrobucca nibe *(Jordan &Thompson) ; b.* Chrysochir aureus *(Richardson); c.* Dendrophysa russelli *(Cuvier); d.* Johnieops macrorhynus *(Mohan); e.* Johnieops sina *(Cuvier); f.* Johnieops vogleri *(Bleeker); g.* Johnius belangerii *(Cuvier); h.* Johnius carutta *Bloch; i.* Johnius dussumieri *(Valenciennes); j.* Johnius macropterus *(Bleeker); k.* Kathala axillaris *(Cuvier); l.* Nibea maculata *(Schneider); m.* Nibea soldado *(Lacepede); n.* Otolithus ruber *(Schneider); o.* Panna microdon *(Bleeker); p.* Pennahia macrophthalmus *(Bleeker); q.* Protonibea diacanthus *(Lacepede)*

***Johnieops sina* (Cuvier)**

A small species, body deeper, DOB 30-35%, snout rounded, mouth large, oblique, teeth in both jaws differentiated into large and small, enlarged teeth in both jaws well spaced, no canines, HL 26-30%, ED 21-31%, gill rakers in the lower limb of Ist gill arch 14-15 (slender), IInd AFS 7-9%. Sagitta: Head of tadpole shaped impression lying parallel to the broad anterior end, tail ending in a hollow cone (Fig.3e). Swim bladder hammer shaped with 12-15 arborescent appendages the Ist pair entering the head (Fig.4e). No distinct colouration (Fig. 9).

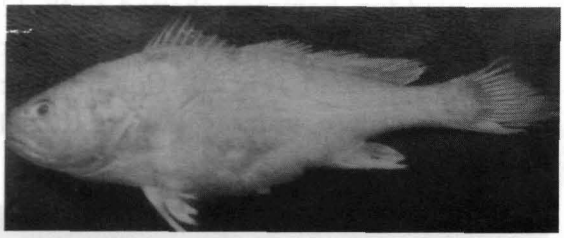

Fig. 9. *Johnieops sina* (Cuvier)

***Johnieops vogleri* (Bleeker)**

Dorsal profile arched, DOB 30-36%, snout rounded, not swollen, mouth large inferior, teeth in both the jaws well differentiated, enlarged teeth widely spaced, no canines. HL 27-31%, eyes large, ED 22-31%, gill rakers in the lower limb of Ist gill arch 9-12 (short and curved). IInd AFS short 6-8%. Sagitta: head of tadpole shaped impression obliquely truncate, the tail deepening into a hollow cone (Fig.3f). Swim bladder hammer shaped with 14-16 pairs of arborescent appendages, the Ist pair entering the head (Fig.4f). No distinct colouration (Fig. 10).

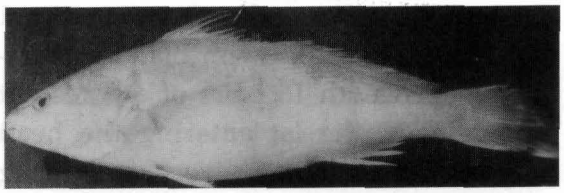

Fig. 10. *Johnieops vogleri* (Bleeker)

***Johnius belangerii* (Cuvier).**

DOB 30-33%, snout steeply rounded, mouth inferior, teeth differentiated in the upper jaw, larger ones closely set, those in the lower jaw villiform. HL 26-31%, ED 23-35%, gill rakers in the lower limb of the first gill arch 8 (short), IInd AFS strong 8-13%. Sagitta: anterior end broader, head of tadpole shaped impression oblique, tail ending in a deep cone (Fig.3g). Swim bladder hammer shaped with 15 pairs of arborescent appendages, the first pair entering the head (Fig.4g). Colouration: Body dark, spinous dorsal fin and lower fins black (Fig. 11).

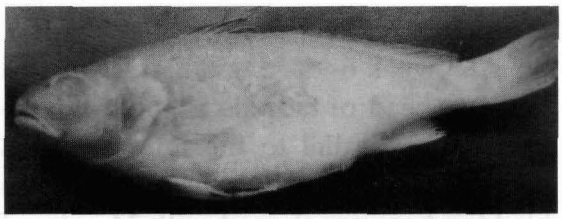

Fig. 11. *Johnius belangerii* (Cuvier)

***Johnius carutta* Bloch**

DOB 27-32%, snout rounded, mouth small, inferior, HL 26-30%, ED 27-28%, teeth differentiated into large and small in upper jaw only, larger ones closely set, lower jaw teeth small, no canines, gill rakers in the lower limb of Ist gill arch 7-8, IInd AFS weak 7-10%. Sagitta: head of the tadpole shaped impression lying parallel to that of

the broad anterior end, tail ending into a deep cone (Fig.3h). Swim bladder: hammer shaped with 16 pairs of arborescent appendages, the Ist entering the head (Fig.4h). Colouration: A silvery streak along the lateral line, spinous part of dorsal fin black edged (Fig. 12).

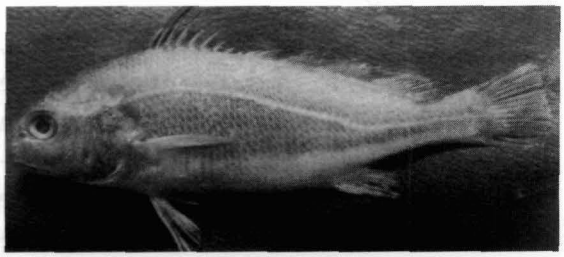

Fig. 12. *Johnius carutta Bloch*

Johnius dussumieri **(Valenciennes)**

DOB 28-32%, snout rounded and projecting, mouth inferior, a blunt barbel on the chin. HL 26-31%, ED 24-35%, teeth differentiated into large and small in the upper jaw only, the larger ones not widely spaced, teeth in lower jaw small, no canines, gill rakers in the lower limb of Ist gill arch 8. IInd AFS weak 6-9%. Sagitta: anterior end broader, head of tadpole shaped impression lying parallel to the long axis, tail deepened into a hollow cone (Fig.3i) Swim bladder: hammer shaped with 14 pairs of arborescent appendages, the Ist pair entering the head (Fig.4i). Colouration: Body black, spinous part of the dorsal fin black (Fig. 13).

Fig. 13. *Johnius dussumieri* (Valenciennes)

Johnius macropterus **(Bleeker)**

DOB 25-35%, snout slightly projecting, mouth inferior, a short stiff barbel on the chin, teeth differentiated into large and small in upper jaw only, the larger ones not widely spaced, teeth in the lower jaw small, no canines. HL 23-28%, ED 27-33%, gill rakers in the lower limb of the Ist gill arch 9-10, IInd AFS 7-10. Sagitta: head of tadpole shaped impression lies horizontally in line with the broad anterior end, tail deepened into a hollow cone (Fig.3j). Swim bladder: hammer shaped with 12 pairs of arborescent appendages, the Ist pair entering the head (Fig.4j). Colouration: Back dark brown, spinous part of dorsal fin black (Fig. 14).

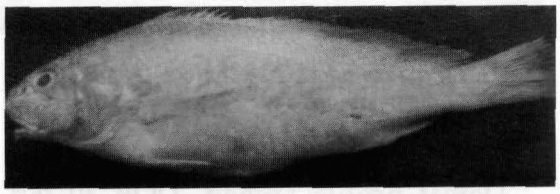

Fig. 14. *Johnius macropterus* (Bleeker)

Kathala axillaris **(Cuvier)**

A small sized species. Body deep, DOB 33-39%, mouth terminal, oblique. HL 29-33%, ED 23-31%, teeth differentiated in both jaws, no canines, gill rakers in the lower limb of Ist gill arch slender-20-21, IInd AFS strong 9-13%, sagitta anterior portion bilobed, head of tadpole shaped impression distinct, the tail is broad, deeply grooved and bent (Fig.3k). Swim bladder: carrot shaped with no side branches. One pair of simple curved tubes at the anterior

end, which traverses into the head (Fig.4k). Colouration: A distinct black blotch on the pectoral fin axil, spinous part of the dorsal fin black (Fig. 15).

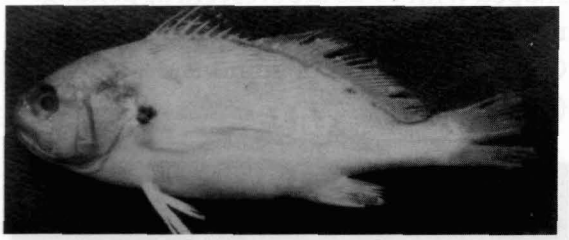

Fig. 15. *Kathala axillaris* (Cuvier)

***Nibea maculata* (Schneider)**

Medium sized, DOB 30-34%, snout prominent, mouth inferior, no barbels, HL 29-32%, ED 22-27%, teeth differentiated into large and small in both jaws, no canines, gill rakers in the lower limb of Ist gill arch 8, IInd AFS strong 8-13%, caudal fin rhomboid. Sagitta: oblong, head of tadpole shaped impression roughly triangular, tail broad, curved and ending in a sharp edge (Fig.3l). Swim bladder: carrot shaped with 19-20 pairs of arborescent appendages, the 1st pair extending into the head, the last 3 pairs branched at the tip (Fig.4l). Colouration: five dark bars extending obliquely from the back to the lower part of the flank, dorsal fin with black boarder (Fig. 16).

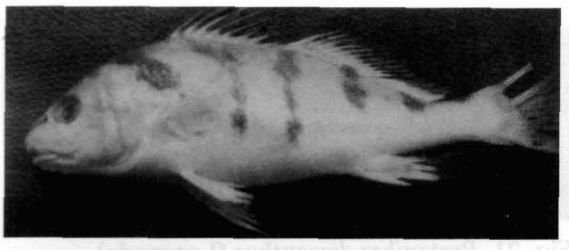

Fig. 16. *Nibea maculata* (Schneider)

***Nibea soldado* (Lacepede)**

A large species, dorsal profile steeply bent, body deep, DOB 29-35%, mouth terminal, HL 27-31%, ED 21-26%, teeth differentiated into large and small in both jaws, IInd AFS very strong 12-16%, gill rakers in lower limb of Ist gill arch 8-9. Sagitta: oblong, tail of tadpole shaped impression with a deep groove and edged sharp (Fig.3m). Swim bladder: carrot shaped with 20 pairs of arborescent appendages, the 1st pair entering head (Fig.4m). Colouration: soft dorsal fin black edged, other fins yellowish (Fig.17).

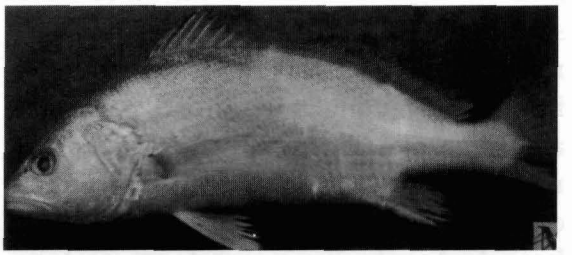

Fig. 17. *Nibea soldado* (Lacepede)

***Otolithus ruber* (Schneider)**

Body slender, DOB 19-28%, mouth large, terminal, teeth in 2 series in upper jaw with 1 or 2 pairs of strong canines in the upper jaw and a pair of canines in the lower jaw. HL 28-31%, ED 19-25%, IInd anal fin spine short and weak (5-6%). Sagitta: elongate, broad in the middle and tapering posteriorly, the tail of tadpole shaped impression only slightly curved (Fig. 3n). Swim bladder carrot shaped with 37 pairs of branched appendages, which are arranged in a regular pattern, no branch entering the head (Fig.4n). Colouration: fins light yellowish(Fig. 18).

Fig. 18. *Otolithus ruber* (Schneider)

***Panna microdon* (Bleeker)**

A slender species, DOB only19-26%, snout pointed, mouth large, teeth differentiated into large and small in both jaws, 1 or 2 canines at the tip of upper jaw, no canines in the lower jaw. HL 27-31%, eyes small, ED11-19%, gill rakers in the lower limb of Ist gill arch 11 of which 2 or 3 are stumpy. IInd AFS weak 4-7%. Sagitta: narrow, elongated, head of tadpole shaped impression oblong, tail is broad, bent with a deep groove (Fig.3o). Swim bladder carrot shaped with a pair of anterior tubule one on either side, which bifurcates into a branched anterior appendage, and an unbranched posterior one, which lies parallel with the body till the posterior end (Fig 4o). Colouration: fins yellowish, 2/3rd of spinous dorsal black (Fig. 19).

Fig. 19. *Panna microdon* (Bleeker)

***Pennahia macrophthalmus* (Bleeker)**

Body deep, DOB 30-36%, mouth terminal and oblique, teeth well differentiated into large and small in both jaws, no canines, HL 29-34%, eyes large, ED 24-37%. IInd anal fin spine 7-11%, gill rakers in the lower limb of Ist gill arch 10. Sagitta: anterior portion broad, tail "hockey stick" shaped (Fig.3p). Swim bladder carrot shaped with 18-20 arborescent appendages none entering the head (Fig.4p). Colouration: 2/3rd of spinous dorsal black (Fig. 20).

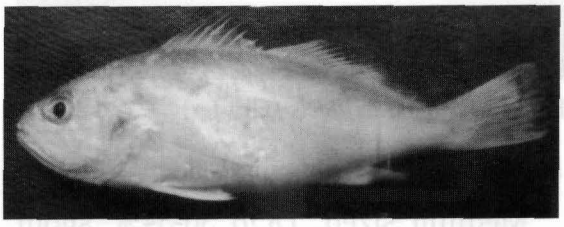

Fig. 20. *Pennahia macrophthalmus* (Bleeker)

***Protonibea diacanthus* (Lacepede)**

Large species, with pointed snout. DOB 26-35%. HL 28-31%. ED16-26%, mouth terminal, teeth differentiated into large and small in both the jaws, no canines. IInd anal fin spine strong 7-10%, gill rakers in the lower limb of Ist gill arch 7. Sagitta: oblong, the tail of tadpole shaped impression abruptly bends after its origin (Fig.3q). Swim bladder: Carrot shaped with 16-20 pairs of arborescent appendages, the Ist pair entering the head, the last 2 simple. (Fig 4q). Coloration: five dark bars and several small black spots on the upper part of the body and caudal fin in juveniles. Pectoral,

Fig. 21. *Protonibea diacanthus* (Lacepede)

pelvic, anal fin and lower part of caudal fin black. Colour : hyaline in larger specimens (Fig. 21).

Discussion

An evaluation of the sciaenid fishery off Kakinada indicates that there is a general declining trend after 1993 till 1999 with a corresponding increase in effort, thus showing that the fishery is exposed to high fishing pressure. Earlier observations have also shown that a decline in catch rate is brought about off Kakinada by the heavy input of effort (Murthy1987; Chakraborty *et al.*, 2000). Rao *et al.*, (1992) also found that off Andhra Pradesh the rate of exploitation of the predominant species of sciaenids is higher necessitating a reduction in the fishing effort. This is mainly because trawling is aimed at catching prawns with cod end mesh size ranging between 19-26mm (mean: 18.5mm). It has also been observed that majority of the boats operate in inshore waters of 5-20m depth where prawns are abundant. Since Kakinada Bay and its surrounding back waters form an excellent breeding and nursery ground for fish and shell fish, the mechanised trawlers with smaller cod end mesh size operating in these area exploit large quantities of juvenile fishes which may be one of the reasons for the depletion in the catches in the long run. To substantiate this, it has been observed that the quantity of croaker juveniles caught ranged between 42 - 73t during 1996-99 constituting an annual average of 9.3% of the total croaker landings (Personal observation by the second author). Murthy (1985) attempted the multispecies stock assessment of a few demersal fishes including *Johnius carutta* and suggested to increase the cod end mesh size to about 20mm, since this will ensure adequate recruitment into the fishery. Another approach would be to venture into deeper waters using larger vessels such as *sona* boat (Chitti babu *et al.*, 1988), since larger boats such as *Sorrah* brought higher catch rates than their smaller counterparts such as *Pablo* and *Pomfrets* (Muthu *et al.*, 1977).

Generally, two peaks of abundance of sciaenid landings during April-May and during August-September (Anon, 1981), during March-April and August-September (Narasimham *et al.*, 1979) are reported off Kakinada. Muthu *et al.*, (1977) observed peak abundance of ground fishes off Kakinada during February-April and corroborated it with extensive upwelling off Vishakhapatnam, which is near to Kakinada. Possibilities of the effect of upwelling on the movements of deep sea fish such as *Psenopsis cyanea* during April off Kakinada has been reported by Abdussamad and Achayya (1998). According to Murthy (1989), upwelling occurs along the northern half of the east coast of India. However, Bensam *et al.* (1994) while studying the hydrographic features off northeast coast of India in relation to demersal resources, corroborated the abundance of trawl catches during January-May with low temperature as low as 24.1-26.5°C. Sekharan *et al.*(1973) quoting Jayaraman (1965) had revealed that upwelling in the northeastern part of Bay of Bengal was too weak to exert any influence on the move-

ment of demersal fishes. In the present study, though no correlation could be made between sciaenid resource abundance and upwelling, a peak catch rate was discernible during February-March invariably during all the years, which agrees with the observation by Bensam *et al.* (1994). Nevertheless, a detailed investigation correlating the hydrological parameters with demersal fishery off Kakinada is necessary to arrive at concrete conclusions regarding their seasonal abundance.

Sciaenids constitute a multispecies fishery represented by about 30 species known from India (Murthy and Ramalingam, 1996). Off Kakinada, this resource is represented by as much as 17 species. Even though there are significant inter-generic variations in relation to the morphological and meristic characters, there is a certain amount of overlapping particularly with respect to the genera of *Johnius* and *Johnieops*. The present study reveals that genus *Johnius* can be distinguished by the possession of inferior mouth and closely set larger teeth in the upper jaw while in genus *Johnieops*, the mouth is terminal/ subterminal /oblique with larger teeth well spaced in the upper jaw. However, *Johnieops macrorhynus*, in spite of possessing an inferior mouth and closely set larger teeth in the upper jaw, is included under genus *Johnieops*, probably because of having slightly enlarged inner teeth in the lower jaw which is characteristic of the genus. Nevertheless, the species can be easily identified by the hood like snout and hence the name "*macrorhynus*" (Lal Mohan, 1975). All other species distributed off Kakinada are identifiable based on the characters described in the foregoing section. It is felt that similar region- wise studies on the field identifying characters of major groups will be worthwhile, since species identification is of vital importance for stock assessment in a multispecies context.

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