

Volume 7, No. 1, January 2017 \* Bimonthly

ISSN: 2251-9939

# Journal of Life Science and Biomedicine



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Volume 7 (1); Jan 25, 2017

Research Paper

**The Use of Lasers and Prosthetic Hernioplasty in Patients with Strangulated Ventral Hernias.**

Kalish YI, Ametov LZ, Khan GV, Shayusupov AR, Yigitaliev SKh.

*J. Life Sci. Biomed.*, 7 (1): 01-05, 2017;

PII:S225199391700001-7

**Abstract**

The issue of using synthetic prosthesis for plasty at strangulated hernia still remains disputable. From 1992 to 2015 we have operated 219 patients with strangulated ventral and inguinal hernias. Patients were randomized in 2 groups. Tensioning means ways of hernioplasty have been performed in 124 patients consisted the 1st group, and the 2nd group consisted of 95 patients have been performed hernioplasty by reticular prosthesis with the use of carbon dioxide laser intraoperatively. Hernias size in the second group was estimated based on Chevrel and Rath (SWR classification) methods. W4 – 6 (12.2%), W3 – 16 (32.6%), W2 – 24(48.9%), W1- 3 (6.1%). Local complications of the postoperative wound in the 1st group have been noted in 15 (13.0%): suppuration – 13, wound hematoma – 1, fecal fistula – 1. Lethality was 4%. In the 2nd group complications of postoperative wound were observed in 33 (35.4%): seroma – 30 and suppuration – 3. Lethality in that group – 3.1%. The analysis of nearest results of postoperative complications showed that suppuration (11.3%) were dominated in the 1st group and in the 2nd one (where used synthetic prosthesis) there was the biggest quantity of seromas 32.6%, and the use of carbon dioxide laser intraoperatively allowed to reduced pyoinflammatory complications in the wound up to 3.3% (3 times less in compared with the 1st group).

**Keywords:** Carbon Dioxide Laser, Prosthesis For Plasty, Postoperative Complications, Strangulated Hernia

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Research Paper

**The Biology Profile of *Sardinella lemuru* in Southern Coast of East Java and Bali Strait, Indonesia.**

Pramana Putra I, Sartimbul A, Widyarti S.

*J. Life Sci. Biomed.*, 7 (1): 06-12, 2017;

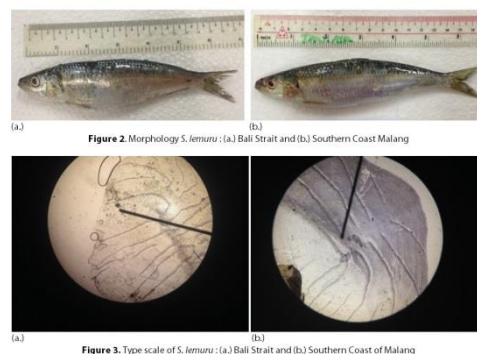
PII:S225199391700002-7

**Abstract**

*Sardinella lemuru* is a species of fish on East Java which has pressure from overfishing and also climate change. This condition can impact their biology profile. The aim of this study was to determine the profile biology (BP) of *S. lemuru* on Southern Coast of East Java. The BP parameters like morphometric and meristic analysis, observation sex ratio, level maturity of gonad and gonad maturity index, were examined. The results showed that the body of *S. lemuru* was compressed or streamline and has blue-green colors on its dorsal. The scale type of *S. lemuru* was cycloid. Females *S. lemuru* were dominant on Southern Coast of East Java. Gonad Maturity Level and Gonad Maturity Index showed that *S. lemuru* from Bali Strait has a higher number than *S. lemuru* from Southern Coast of Malang. Since *S. lemuru* from both origins had similarities in its morphology and gonad, it was suspected that *S. lemuru* was migrating from Bali Strait to Southern Coast of Malang. Further study should be conducted so that the data could more represent biology profile of *S. lemuru* in southern coast of East Java by adding genetical analysis.

**Keywords:** *Sardinella lemuru*, Southern Coast of East Java, Biology Profile

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# Journal of Life Science and Biomedicine



**ISSN:** 2251-9939

**Frequency:** Bimonthly

**Current Issue:** 2017, Vol: 7, Issue 1 (January)

**Publisher:** [SCIENCELINE](#)

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# The Use of Lasers and Prosthetic Hernioplasty in Patients with Strangulated Ventral Hernias

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## ABSTRACT

The issue of using synthetic prosthesis for plasty at strangulated hernia still remains disputable. From 1992 to 2015 we have operated 219 patients with strangulated ventral and inguinal hernias. Patients were randomized in 2 groups. Tensioning means ways of hernioplasty have been performed in 124 patients consisted the 1<sup>st</sup> group, and the 2<sup>nd</sup> group consisted of 95 patients have been performed hernioplasty by reticular prosthesis with the use of carbon dioxide laser intraoperatively. Hernias size in the second group was estimated based on Chevrel and Rath (SWR classification) methods. W4 – 6 (12.2%), W3 – 16 (32.6%), W2 – 24 (48.9%), W1 – 3 (6.1%). Local complications of the postoperative wound in the 1<sup>st</sup> group have been noted in 15 (13.0%): suppuration – 13, wound hematoma – 1, fecal fistula – 1. Lethality was 4%. In the 2<sup>nd</sup> group complications of postoperative wound were observed in 33 (35.4%): seroma – 30 and suppuration – 3. Lethality in that group – 3.1%. The analysis of nearest results of postoperative complications showed that suppuration (11.3%) were dominated in the 1<sup>st</sup> group and in the 2<sup>nd</sup> one (where used synthetic prosthesis) there was the biggest quantity of seromas 32.6%, and the use of carbon dioxide laser intraoperatively allowed to reduced pyoinflammatory complications in the wound up to 3.3% (3 times less in compared with the 1<sup>st</sup> group).

## Original Article

PII: S225199391700001-7

Rec. 22 Nov. 2016  
Acc. 10 Jan. 2017  
Pub. 25 Jan. 2017

## Keywords:

Carbon Dioxide Laser,  
Prosthesis For Plasty,  
Postoperative  
Complications,  
Strangulated Hernia

## INTRODUCTION

Strangulated hernias take the fourth place subject to the frequency of operative interventions in the urgent surgery. Postoperative lethality varies from 10 to 40% [1] and depends on some objective reasons. It is generally known that strangulated hernia's treatment outcome is directly proportional to the time of incarceration moment up to the hospital admission. Elderly and gerontal ages of patients, presence of concomitant diseases are also important. Incarceration of caval organs (16%-21%) is often complicated by acute bowel obstruction or by necrosis of strangulated loop with peritonitis development [2, 3].

In spite of strangulated exterior abdomen hernia's diagnostics comparative simplicity, patients are admitted 12 hours later from disease starting, at the presence of evident signs of acute bowel obstruction (ABO) and lethality can reach 35% in patients of elderly and gerontal ages [4, 5]. Ultrasound investigation (USD) is one of the objective diagnostic criteria in emergency herniology along with X-ray investigation of abdominal cavity. USD data allow detecting type and nature of incarceration, condition of strangulated organs, to perform differentiated diagnostics in 88% patients [6, 7].

Well-timed and correct diagnostics of strangulated ventral hernia and also concomitant surgical pathology allows choosing adequate surgical tactics. But operative treatment at strangulated hernias is characterized by its own peculiarities and high risk for the patient. At strangulated hernia's operative treatment the key-point issue to be solved is the choice of the type of abdominal wall defect closure which is often performed in infected conditions. Hernia plasty by local tissues still remains traditional type [8]. Unfortunately, it is effective only at small hernias and in patients of the young and middle age. In patients with giant and recurrent hernias which are often complicated by incarceration, relapse reaches 40-60% [9].



Deficiency of own tissues at hernia ring plasty and appearing syndrome of intra-abdominal pressure increasing are very important. Replacement of hernia contents into abdominal cavity leads to respiration limitation, cardiac activity disorder and other complications due to diaphragm high standing and developed deficiency of abdominal cavity. Compressing, tension autoplasy at giant and "non-enclosing" hernias sometimes leads to the development of fatal abdominal compartment-syndrome (ACS) [10]. That is why it is more rational to use hernioplasty "without tension" with the application of up-to-date polymeric materials in these patients.

The issue of the transplants use is challenged by some authors who consider that it increases the risk of wound complications and in some cases can lead to transplant rejection. Surgical treatment of hernias in infection conditions is the most complicated problem of herniology connected with the high risk of wound infection development and hernia's relapse [11]. This study has been done to investigate nearest results of allohernioplasty and the use of laser techs in patients with strangulated hernias.

## MATERIAL AND METHODS

219 patients with strangulated ventral and inguinal hernias were operated in the department of laser surgery at RSCS named after acad. V.Vakhidov from 1992 to 2015. Patients were divided into two groups. To the period from 1992-2004 when tension types of hernioplasty were performed 124 patients have been included who made up the 1<sup>st</sup> group and since 2005-2015 - the 2<sup>nd</sup> group in which 95 patients have been performed prosthetic hernioplasty.

Patients age in the 1<sup>st</sup> group varied from 13 to 85 years, mean age made up  $55.1 \pm 1.3$  years. Anamnesis of hernia carriage was from 1 month to 35 years, mean anamnesis made up  $7.6 \pm 0.76$  years. Mean time from incarceration moment till hospital admission made up  $26.3 \pm 2.7$  hours. In this group, patients with strangulated inguinal hernias dominated – 47 ones, umbilical hernias – 46 ones, ventral hernias – 27 cases, and white line – 6 people. From 124 patients the relapse hernias had in 24% cases, the quantity of relapses varied from 1 to 6. Mean area of herniation consisted of  $147.6 \pm 17.6$  cm<sup>2</sup>. All patients were informed about conducted study. All data was provided with their permission.

In the 2<sup>nd</sup> patients group with the use of prosthetic hernioplasty mean age was  $57.1 \pm 1.2$  years, minimal - 20 years, maximal - 82 years. Patients suffered from hernia carriage  $9.0 \pm 1.0$  years at average and it from 1 moth to 40 years. The area of herniation made up –  $218.8 \pm 27.0$  cm<sup>2</sup>. The time from incarceration moment to hospital admission was  $32 \pm 3.3$  hours at the average. Subject to the hernia type in the 2<sup>nd</sup> group patients have been randomized as follows: ventral – 49, umbilical – 31, inguinal – 14, abdomen white line hernia -1. Relapse hernias made up 36.8 % of them and their quantity was from 1 to 6.

At admission patients were performed standard investigation (clinical-biochemical analysis, functional and X-ray investigations) and also ultrasound investigation (USI) of hernia sac contents aponeurosis defect sizes. All patients had clinics of bowel obstruction which has been confirmed by X-ray investigation of abdominal cavity organs. In the 1<sup>st</sup> patients group X-ray pattern of bowel obstruction (as ileal arch or Kloiber's cups) has been formed in 20% and in the 2<sup>nd</sup> group in 35 % cases.

**Table 1.** Randomizing of patients by age

Items	<19	19-44	45-59	60-74	>75
The 1 <sup>st</sup> group	2	26	39	51	6
The 2 <sup>nd</sup> group	-	9	44	37	5

\*p>0.05

**Table 2.** Time of patients address to hospital from incarceration clinics start

Items	< 12 hours	12-24 hours	>24 hours
The 1 <sup>st</sup> group	61	26	37
The 2 <sup>nd</sup> group	33	28	34

\*p>0.05

## Ethical approval

The review board and ethics committee of RSCS named after acad. V.Vakhidov approved the study protocol and informed consents were taken from all the participants.

## RESULTS AND DISCUSSION

Patients have been operated in the regime of high keeping all antiseptic roles. After elimination and opening of hernia sac in 50% there was noted hernia waters supply. In the 1<sup>st</sup> group 3 patients had hernia sac phlegmon. In all cases there was an inflammation in the hernia sac characterized by edema and infiltration of sac walls. The condition of hernia sac and hernia ring has been visually estimated. Hernia sizes in the 2<sup>nd</sup> group were estimated by J.P. Chevrel and A.M. Rath classification (SWR classification) – 1999 [12]. There were 6 patients (12.2%) with W4, W3 - 16 (32.6%), W2 - 24(48.9%), W1 -3 (6.1%) cases. As it is seen from the table 3 there are no significant differences by the nature of strangulated organ and the quantity of their resections. In both groups after bowels resection with anastomosis has been put in “side to side”.

117 patients in the 1<sup>st</sup> group were performed muscular-aponeurotic plasty, 7 patients were not underwent plasty due to hernia sac phlegmon 3 patients, hepatocirrhosis, ascites 1 patients and peritonitis 3 patients. In the 2<sup>nd</sup> group patients before implanting of mesh, aponeurosis and mobilized subcutaneous fat were irradiated by carbon dioxide laser in defocused regime with “Scalpel-1” apparatus, capacity-25 watt and exposure time 1 sec to 1cm<sup>2</sup>. Detected ligature granulomas were worked up by carbon dioxide laser up to carbonization and evaporation. Hernioplasty with implantation of mesh has been performed in different positions: in onlay (71), sublay (5), intra-abdominal (1) and correction of anterior abdominal wall with prosthetic plasty (6). In 12 cases subject to inguinal hernia Liechtenstein’s operation has been performed. Surgery was ended by drain of paraprosthetic area by Redon. Drainages were removed after 4-5 days.

In the 2<sup>nd</sup> group USI of postoperative wound has been carried out in the postoperative period. In 33 cases echonegative liquid-containing foci was detected. Local complications of the postoperative wound in the 1<sup>st</sup> group were noted in 15 (13.0%) Lethality made up 4%. In the 2<sup>nd</sup> group postoperative wound complications were observed in 33 (35.8%) patients. Lethality in this group – 3.1 %.

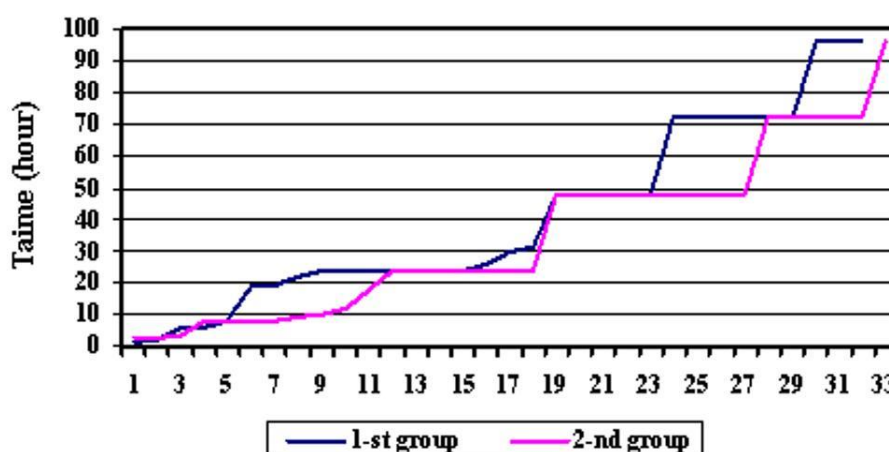
**Table 3.** Organ incarceration and quantity of their resections

	Bowels		Omentum		Urinary bladder
		Resection		Resection	
1 <sup>st</sup> group	66	12 (18%)	56	20 (35%)	2
2 <sup>nd</sup> group	65	10 (15%)	30	22 (73%)	0

**Table 4.** Postoperative wound complications

Wound complications	1 <sup>st</sup> group (n=115)	2 <sup>nd</sup> group (n=92)
Suppuration*	13	3
Hematoma	1	-
Fecal fistula	1	-
Seromas	-	30

\*p<0.05 (Chi-square (df=1) - p=0.31; Fisher exact p, p=0.036)



**Graph 1.** Dependence of strangulated organ necrosis from the time of incarceration clinics start



Both groups were comparable by age and persons elder than 60 years made up 44-45%. One of the main factor influencing on intra-operative picture and postoperative period course is incarceration time. In the 1<sup>st</sup> group 30% patients addressed 24 hours later and in the 2<sup>nd</sup> one - 35% patients. As the diagram shows, necrosis of strangulated organ (bowels, omentum) and its resection are directly proportional to the time of incarceration start.

More than 85% patients with bowels or omentum necrosis who were underwent resection, admitted to hospital 24 hours later. The decision about operative treatment of strangulated hernia is taken on the base of subjective (pain in the hernia area, palpatory tenderness of the hernia sac) or objective signs (clinics of acute bowel obstruction). But definition of presence or absence of intestine or omentum incarceration in patients of old and gerontal age with associated pathology is not always possible. Due to incarceration manifestation peculiarities, the quantity of diagnostic mistakes remains rather significant [13]. Occurrence of bowel obstruction, compression and necrosis of strangulated organs are the reasons of hernial sac and its contents infection and as a consequence – appearance of wound infection in patients with strangulated hernias [14].

The use of synthetic transplants at hernioplasty “without tension” allows to avoid of abdominal cavity deficit formation and to prevent cardiopulmonary disorders in postoperative period without special adaptation of patients, especially in old and gerontal aged patients with many concomitant diseases. Analysis of local postoperative complications results showed that in the 1<sup>st</sup> group suppurations dominated (11.3%), in the 2<sup>nd</sup> group with the use of synthetic prosthesis the was the biggest quantity of seromas (32.6%), and applying of carbon dioxide laser intra-operatively allowed to reduce pyoinflammatory complications in wound up to 3.3%, three times less in compare with the 1<sup>st</sup> group. In both groups in patients with occurred wound complications there were loops of small intestine in hernia sac contents.

For microbial contamination prevention different methods were offered among which antibiotic therapy is a traditional one. Schemes of antibiotics applying before surgery with their going on in the postoperative period have been worked out [15]. But wide mobilization of subcutaneous fat leads to blood circulation and lymphokinesia, micro-circulation disorder due to which it is complicated to achieve proper concentration of antibiotics in the zone of implantation. Kuznetsov [16] determined that the use of reticular prosthesis in the surgical treatment of strangulated hernias is one of determinant factor of increasing the frequency of purulent wound complications and standard schemes of antibiotic prophylaxis and antibiotic therapy do not allow eliminating it. Why authors conclude that traditional scheme of antibiotic prophylaxis used in surgical treatment at strangulated hernias is not effective and does not meet modern requirements of hernioplasty. Its reconsideration and adoption of new schemes may to lead to the reducing of pyoinflammatory wound complications frequency in such type of patients.

The use of high-energy carbon dioxide laser (CO<sub>2</sub>) intra-operatively allows to achieve bactericidal effect in wound and its work in one mode regime (Gauss’ mode) stimulates regeneration processes and leads to accelerated integration of mesh in surrounding tissues.

In patients with strangulated ventral hernias the use of carbon dioxide laser allows to perform prosthesis implantation. Inflammatory changes developed on the background of acute bowel obstruction or due to necrosis of hernia sac contents (except phlegmon) are not contraindication to allohernioplasty and prosthesis implantation made of polypropylene.

## CONCLUSION

1. At strangulated extensive, giant, relapsed ventral hernias the surgery of choice is prosthetic hernioplasty.
2. Indication to the use of reticular prosthesis is hernia’s relapse, impossibility of defect elimination without tension.
3. Necrotic changes of strangulated organ and its resection are not contraindication to prosthetic plasty.
4. Over-aponeurotic (onlay) prosthesis placing at plasty of strangulated hernias is the most reliable from the practical point of view as required less time consumption.
5. The use of high-energy lasers in patients with applying allohernioplasty in the conditions of infection reduces the quantity of wound complications.

## Acknowledgements

This work was supported by Republican Specialized Centre of Surgery, Tashkent City, Uzbekistan.

## Authors’ Contributions

All authors contributed equally to this work.

## Competing interests

The authors declare that they have no competing interests.

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# The Biology Profile of *Sardinella lemuru* in Southern Coast of East Java and Bali Strait, Indonesia

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## ABSTRACT

*Sardinella lemuru* is a species of fish on East Java which has pressure from overfishing and also climate change. This condition can impact their biology profile. The aim of this study was to determine the profile biology (BP) of *S. lemuru* on Southern Coast of East Java. The BP parameters like morphometric and meristic analysis, observation sex ratio, level maturity of gonad and gonad maturity index, were examined. The results showed that the body of *S. lemuru* was compressed or streamline and has blue-green colors on its dorsal. The scale type of *S. lemuru* was cycloid. Females *S. lemuru* were dominant on Southern Coast of East Java. Gonad Maturity Level and Gonad Maturity Index showed that *S. lemuru* from Bali Strait has a higher number than *S. lemuru* from Southern Coast of Malang. Since *S. lemuru* from both origins had similarities in its morphology and gonad, it was suspected that *S. lemuru* was migrating from Bali Strait to Southern Coast of Malang. Further study should be conducted so that the data could more represent biology profile of *S. lemuru* in southern coast of East Java by adding genetrical analysis.

Original Article

PII: S225199391700002-7

Rec.	20 Nov.	2016
Acc.	16 Jan.	2017
Pub.	25 Jan.	2017

## Keywords

*Sardinella lemuru*,  
South Malang Coast  
and Bali Strait of East  
Java,  
Biology Profile

## INTRODUCTION

The condition of Southern coast of East Java is fertile. This condition is influenced by oceanographic process, especially upwelling [1]. Upwelling occurs when water mass and nutrients from the sea bed rises to the surface and make conditions in the surface becomes fertile [2]. In this condition, many small pelagic fish were found in the water column. One of the small pelagic fish most frequently found was *Sardinella lemuru* [3]. It is one of the main commodities small pelagic fish that exist in the South Coast of East Java and Bali Strait [4].

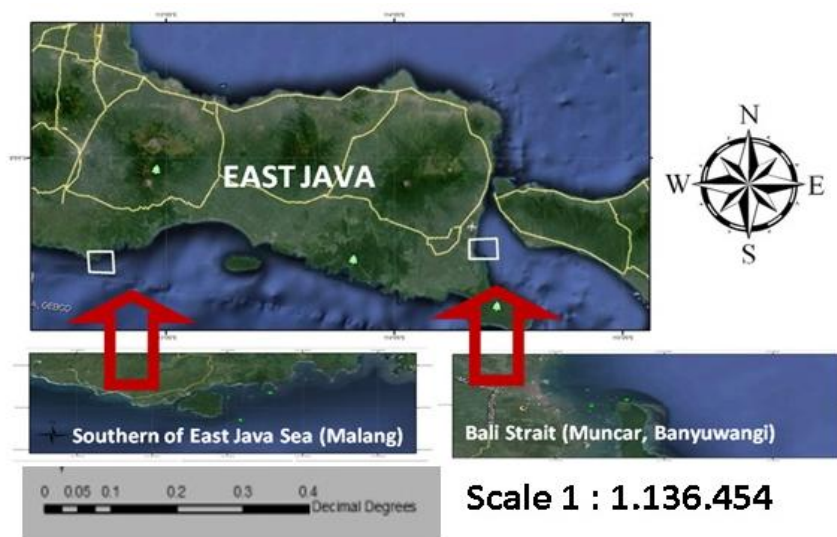
*Sardinella lemuru* has an important economic value because the nutrients containing: 78% water, 20% protein, and 0.7% fat [5]. There was approximately 90% of fish caught by fishermen of Bali Strait [6]. Fishery industries increased because there are many consumers demand for *S. lemuru*. Indirectly, this condition can lead the overfishing condition of *S. lemuru* and affect the biological profile of *S. lemuru* [7]. One of effort to conserve fishery resources especially for *S. lemuru* is necessary to determine the biology profile of *S. lemuru* at Southern Coast of East Java and Bali Strait.

The aim of this study was to determine and classify the biology profile of *S. lemuru*. The biology profile examined in this study was: morphometric and meristic analyses, sex ratio observation, maturity level of gonad and gonad maturity index.

## MATERIAL AND METHODS

### Data Collecting

This study was conducted in August and September 2015. *Sardinella lemuru* was collected from Bali Strait (114,369588 ; 8, 451985) and Southern Coast of Malang, East Java (112,726610 ; 8,467681) (Figure 1). Total specimens used in this study are 30 specimens from two research area. Specimens' size was ranged from 15–17 cm long and 35–45 g weight.



**Figure 1.** Map of research area was showing the two sampling sites: Southern of East Java Sea (Malang) and Bali Strait

### Morphology, morphometric and meristic analysis

The observation of *S. lemuru* morphology included the types of scales, color pattern, body shape, tail shape, tail type and fish weight. Besides morphology, thus morphometrics and meristics parameters were also conducted in this study. Morphometrics analyses were measuring the total length (TL), standard length (SL), forked length (FL) and orbital length (OrbL). While the meristics parameters were including the total dorsal and anal scutes, total dorsal and anal fin rays [8].

### Analysis of sex ratio

Sex ratio analysis was used in order to determine the sex of *S. lemuru* as to be seen on genitalia hole. The genitalia hole was indicated the differences between male and female of *S. lemuru*. The sex ratio can be calculated based on the total male and female. Pattern to calculate sex ratio refers to the reference [9].

$$S = \frac{\sum m}{\sum f}$$

Note: S = sex ratio  
 $\sum m$  = Total male specimens  
 $\sum f$  = Total female specimens

### Gonad maturity

Fish maturity can be analyzed by determining the maturity level and maturity index of *S. lemuru* gonad. Maturity level of *S. lemuru* can be observed by looking at the shape, color and weight of the gonads [10]. The Standard to estimate maturity level of *S. lemuru* gonad referred to Holden and Rait (1974) [11]. The description of maturation level of *S. lemuru* was presented at Table 1. Gonad maturity index can be observed by measuring total fish weight and gonad weight. Pattern to calculate refers to the reference [10].

$$GMI = \frac{\text{Gonad Weight}}{\text{Fish Weight}} \times 100$$

**Table 1.** Maturation level of *S. lemuru* gonad [11].

Stage	Status
1	Immature
2	Developing
3	Ripening
4	Mature
5	Spawning

### Statistical analysis

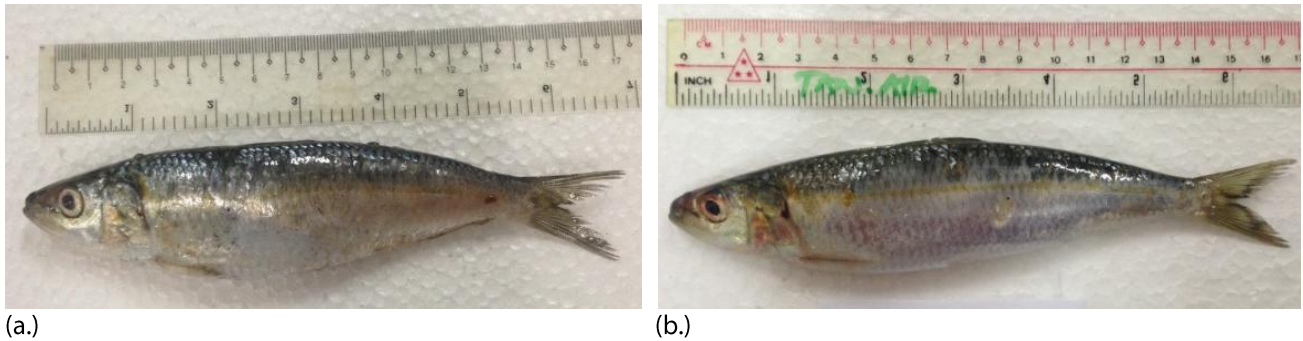
All data were analyzed by with description method. Morphometric and meristic data were analyzed by PAST software with clustering analysis to classify based on the similarity index. The gonad profile was analyzed with description method.



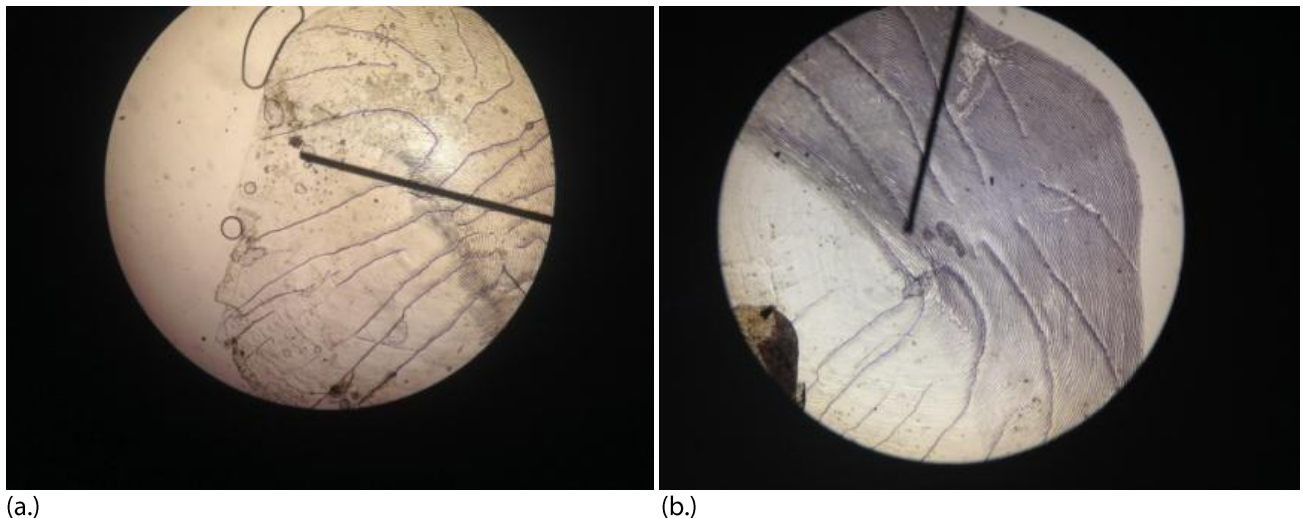
## RESULTS

### Morphology of *S. lemuru*

*S. lemuru* caught from Bali Strait and Southern Coast Malang has been observed. Then, the morphology form has directly observed such body shape, type of tail and type of scale. The description of *S. lemuru* from Bali Strait and Southern Coast Malang is shown on Figure 2. Scale type of *S. lemuru* also observed in this study that aims to classify *S. lemuru* from two areas in Southern Coast of East Java. Fish scale also can predict these classifications as carnivores or herbivores and also to predict fish ages. Scale type of *S. lemuru* is shown on Figure 3.



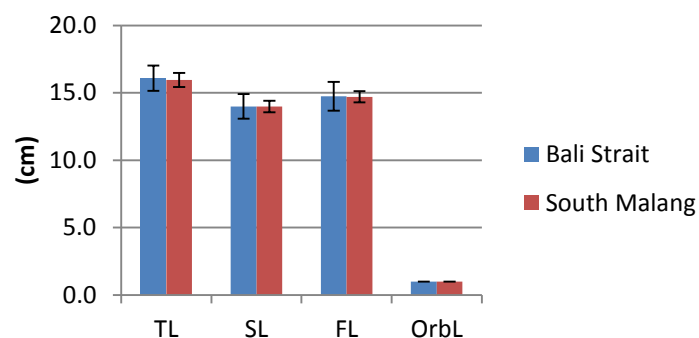
**Figure 2.** Morphology *S. lemuru* : (a.) Bali Strait and (b.) Southern Coast Malang



**Figure 3.** Type scale of *S. lemuru* : (a.) Bali Strait and (b.) Southern Coast of Malang

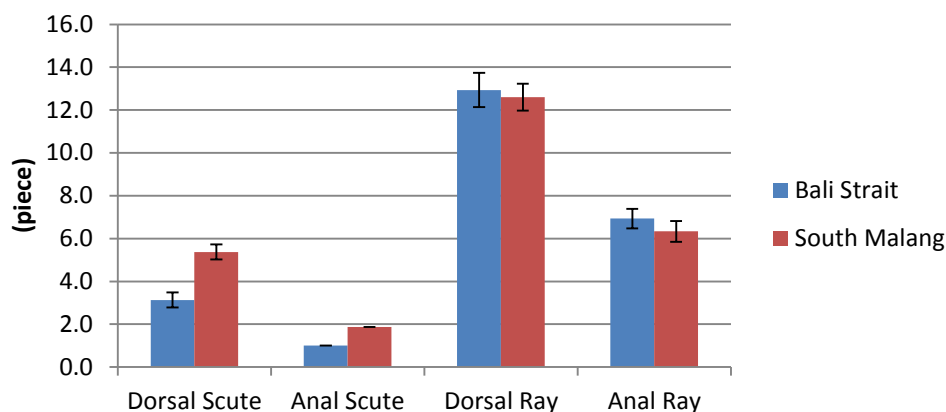
### Morphometric and meristic analyses

Morphometric and meristic data showed that the size of *S. lemuru* from Bali Strait was bigger than *S. lemuru* from Southern Coast of Malang. Environmental factors in the ocean can affect the growth of fish in the ocean. Upwelling is one of environmental factors which regulates the nutrients in the ocean. The diagram of *S. lemuru* morphometric is shown on Figure 4.



**Figure 4.** Diagram morphometric of *S. lemuru*

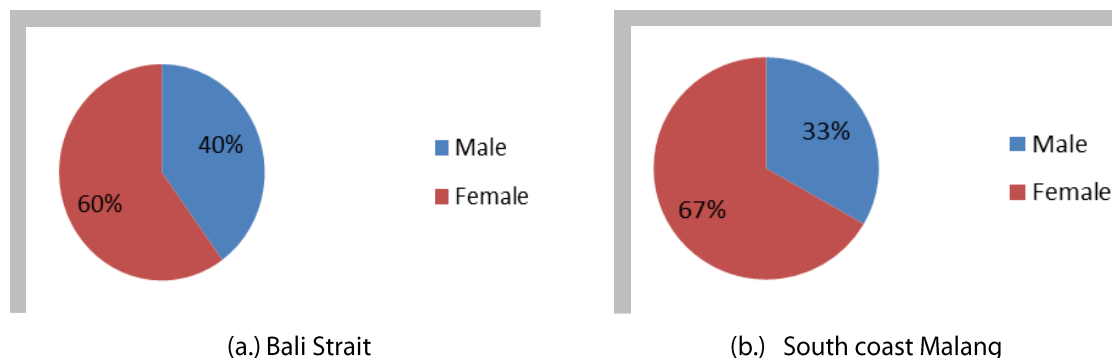
The data of meristic showed the same result with the morphometric data. However, the number of dorsal scute and anal scute of *S. lemuru* from Southern Coast of Malang was more than *S. lemuru* from Bali Strait. This condition can be caused by the enviromental factors and the availibility of food stock in the ocean. The diagram of *S. lemuru* meristic is shown on Figure 5.



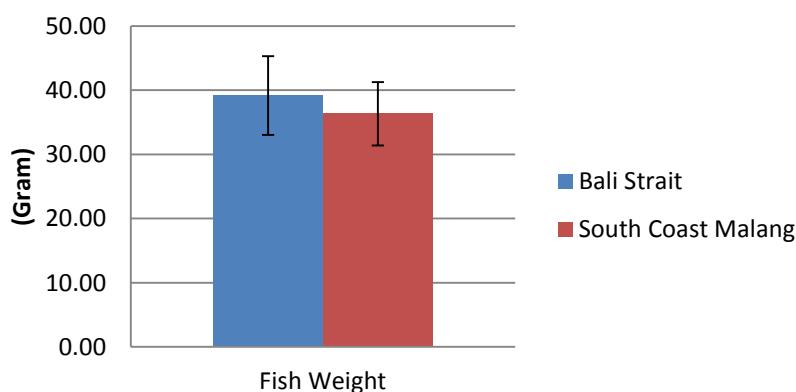
**Figure 5.** The meristic diagram of *S. lemuru*

### Sex ratio analysis

The analysis of sex ratio was aimed to know the sex composition on the fish population. Sex determination on fish can be conducted directly by observing the fish genitalia holes. The sex composition of *S. lemuru* is shown on Figure 6. Measurements of *S. lemuru* gonad weight was also carried out in this study that aimed to determine the profile of *S. lemuru* gonad in Southern Coast of East Java. The diagram of *S. lemuru* gonad weight is shown on Figure 7. Sex ratio of *S. lemuru* can be determined when the data about fish sex was obtained. Sex ratio of *S. lemuru* can be calculated with the ratio of the total number of female with male fish. The result showed that the sex ratio *S. lemuru* in Bali Strait (0,7) was higher than the sex ratio *S. lemuru* in Southern Coast of Malang (0,5).



**Figure 6.** The sex composition of *S. lemuru* in the (a.) Bali Strait and (b) Southern Coast Malang



**Figure 7.** The diagram of *S. lemuru* gonad weight



### Maturity of gonad

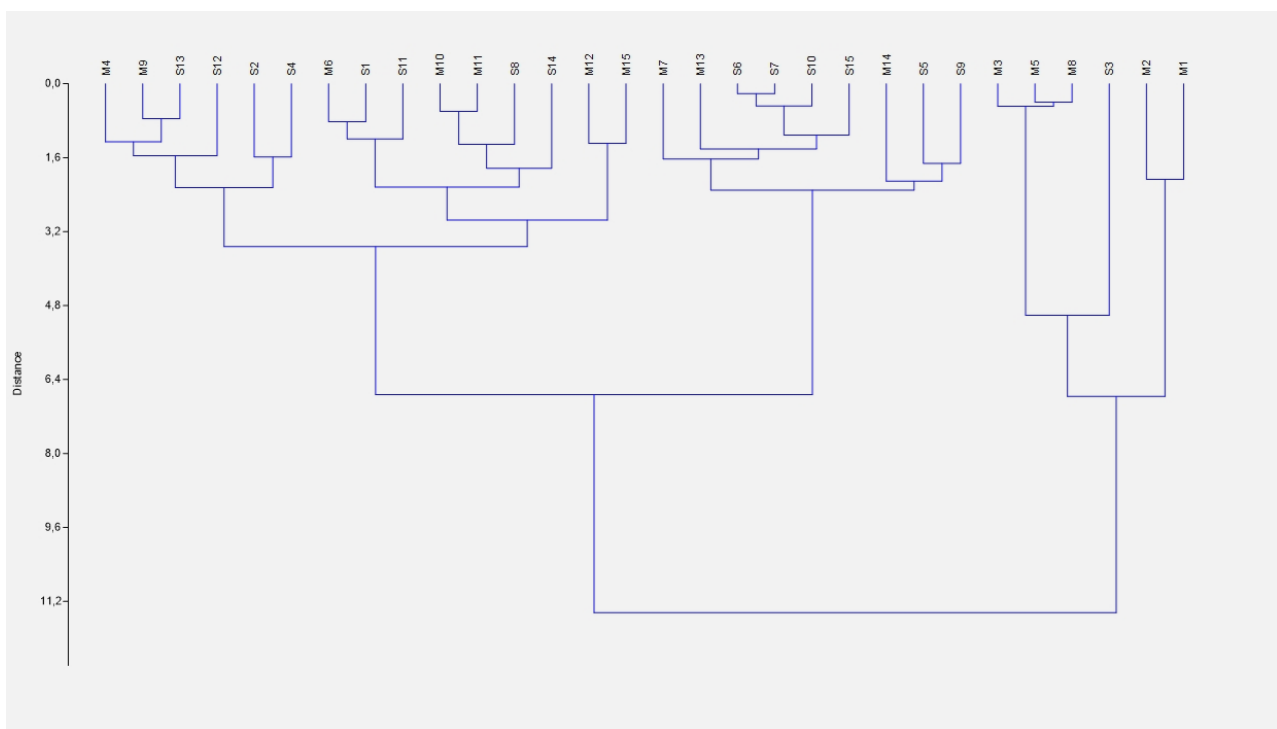
Specimens were dissected on the fish abdomen then fish gonads were observed directly. Analysis to determine Gonad Maturity Level (GML) and Gonad Maturity Index (GMI) was observed the condition of the gonads. Table of GML and GMI of *S. lewuru* in Southern Coast of East Java is shown on Table 2.

### Clustering analysis

Morphometric and meristic data were analyzed using clustering analysis. The results of the analysis were obtained based on the index similarity. The result of clustering analysis of *S. lewuru* morphometric and meristic is shown on Figure 8. Based on the result of clustering analysis, the specimen which has the closest index similarity area were S6 and S7 approximately 0,1 while the furthest index similarity are M2 and M1 approximately 1,8.

**Table 2.** Gonad Maturity Level (GML) and Gonad Maturity Index (GMI) of *S. lewuru* in Southern Coast of East Java

Specimen	Bali Strait		Southern Coast of Malang	
	GML	GMI	GML	GMI
1	II	0.005	I	0.003
2	II	0.004	I	0.003
3	II	0.005	I	0.003
4	II	0.006	I	0.003
5	II	0.006	I	0.005
6	II	0.007	I	0.004
7	II	0.007	I	0.003
8	II	0.005	I	0.003
9	II	0.005	I	0.005
10	II	0.005	I	0.004
11	II	0.006	I	0.004
12	II	0.006	I	0.004
13	II	0.006	I	0.003
14	II	0.008	I	0.003
15	II	0.007	I	0.005



**Figure 8.** The result of clustering analysis of *S. lewuru* morphometric and meristic

## DISCUSSION

No significant differences were found on the Morphology of *S. lemuru* from Bali Strait and Southern Coast of Malang. *S. Lemuru* has a compressed body, blue-green colour on dorsal and their scale is cycloid [5]. Morphological form of *S. lemuru* had been studied such as: the similarities morphology of *S. lemuru* on Madura Strait, Bali Strait and Southern Coast Java. There is no significantly differentiation between specimens from three study areas. It means in these areas, *S. lemuru* has the lowest variation of morphology forms [12]. However, *S. lemuru* in Bali Strait has dynamics population because in this area these fish have the highest variation of morphology. *S. lemuru* caught from different area in Bali Strait showed the significant differences [13]. The main habitat of *S. lemuru* from East Java commonly in Bali Strait [5]. Water temperature can also affect the sex formation of fish embryos and their hormonal cycle. The increasing sea surface temperature can stimulate testosterone hormone on the fish body.

Meanwhile, when the temperature lower, hormone testosterone can not stimulates well but the other hormone such estrogen stimulates very well on the fish body. The low temperature in the ocean will mostly produce female sex formation [14]. Monsoons can regulates formation the population of *S. lemuru* in the ocean. *S. lemuru* on Eastern Monsoon mostly found females and so different when on Western Monsoon mostly found males [12]. The weight of *S. lemuru* gonad related with maturity level of gonads. The *S. lemuru* gonad which has heaviest weight can affect maturity level and index [4]. Gonad Maturity Level (GML) *S. lemuru* on January mostly found first stage of GML and turned into second stage at February. Then, *S. lemuru* GML reach on third stage on the end of March. This assumption can justify that spawning season occurs on June until July. On September, mostly in Bali Strait found juvenile of *S. lemuru* with range size approximately 5 cm [15].

## CONCLUSION

Generally, *S. lemuru* on Southern Coast of East Java has no significant differences. Morphology of *S. lemuru* from that area showed similar forms. The body of *S. lemuru* was compressed or streamline and has blue-green colors on its dorsal. The scale type of *S. lemuru* was cycloid. Females *S. lemuru* were dominant on Southern Coast of East Java. Gonad Maturity Level and Gonad Maturity Index showed that *S. lemuru* from Bali Strait had a higher number than *S. lemuru* from Southern Coast of East Java. Since *S. lemuru* from both origins had similarities in its morphology and gonad, it was suspected that *S. lemuru* was migrating from Bali Strait to Southern Coast of Malang. Further study should be conducted so that the data could more represent biology profile of *S. lemuru* in southern coast of East Java by adding genetical analysis.

### Acknowledgements

I would like to thank all the people who contributed in some way to this study. First and foremost, I would like to thank the Ministry of Research, Technology and Higher Education of the Republic of Indonesia for the opportunity to add this study as a collaboration research with contract No: 137/SP2H/LT/DRPM/III/2016. And also to MEXMA, a research group that has been contributing to distribute the grant from the Ministry of Research, Technology and Higher Education of the Republic of Indonesia on this research.

### Authors' Contributions

**Conception and design of study:** Indra Pramana Putra, Aida Sartimbul, Sri Widyarti;

**Acquisition of data:** Indra Pramana Putra;

**Analysis and/or interpretation of data:** Indra Pramana Putra, Aida Sartimbul, Sri Widyarti.

**Drafting the manuscript:** Indra Pramana Putra;

**Revising the manuscript critically for important intellectual content:** Indra Pramana Putra.

**Approval of the version of the manuscript to be published :** Indra Pramana Putra, Aida Sartimbul, Sri Widyarti

### Competing interests

I declare that I have no significant competing financial, professional or personal interests that might have influenced the performance or presentation of the work described in this manuscript.

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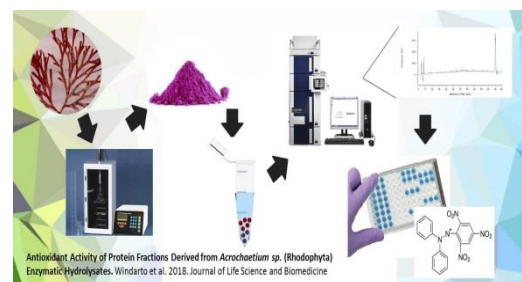
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1. Hasan V, Sri Widodo M and Semedi B. 2015. Oocyte diameter distribution and fecundity of Javaen Barb (*Systomus Orphoides*) at the start of rainy season in Lenteng River, East Java, Indonesia insurance. J. Life Sci Biomed, 5(2): 39-42.
2. Karen KS, Otto CM. 2007. Pregnancy in women with valvular heart disease. Heart. 2007 May; 93(5): 552-558.
3. Doll MA, Salazar-González RA, Bodduluri S, Hein DW. Arylamine N-acetyltransferase 2 genotype-dependent N-acetylation of isoniazid in cryopreserved human hepatocytes. Acta Pharm Sin B, 2017; 7(4):517-522.

### For In press manuscripts (maximum 2):

Hasan V, Sri Widodo M and Semedi B. 2015. Oocyte Diameter Distribution and Fecundity of Javaen Barb (*Systomus Orphoides*) at the Start of Rainy Season in Lenteng River, East Java, Indonesia insurance. In press.

### For symposia reports and abstracts:

Cruz EM, Almatar S, Aludul EK and Al-Yaqout A. 2000. Preliminary Studies on the Performance and Feeding Behaviour of Silver Pomfret (*Pampus argentens euphrasen*) Fingerlings fed with Commercial Feed and Reared in Fibreglass Tanks. Asian Fisheries Society Manila, Philippine 13: 191-199.

### For Conference:

Skinner J, Fleener B and Rinchiuso M. 2003. Examining the Relationship between Supervisors and Subordinate Feeling of Empowerment with LMX as A Possible Moderator. 24th Annual Conference for Industrial Organizational Behavior.

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Russell, Findlay E, 1983. Snake Venom Poisoning, 163, Great Neck, NY: Scholium International. ISBN 0-87936-015-1.

### For Web Site:

Bhatti SA and Firkins JT. 2008. [http://www.ohioline.osu.edu/sc1156\\_27.html](http://www.ohioline.osu.edu/sc1156_27.html).

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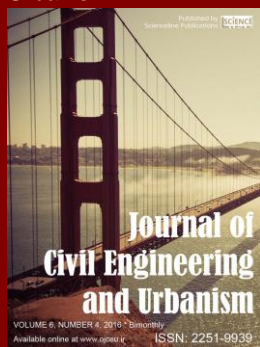
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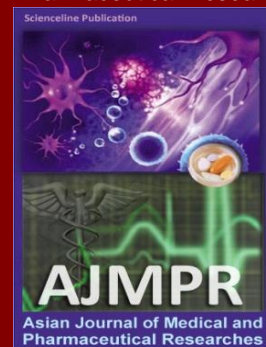
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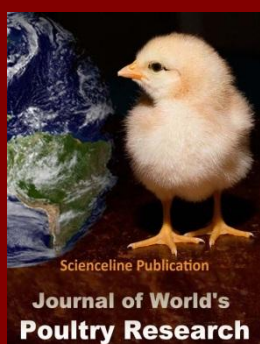
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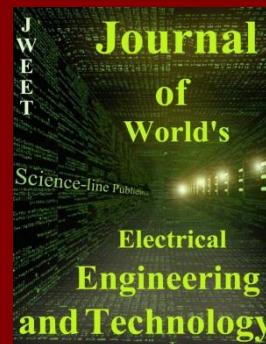
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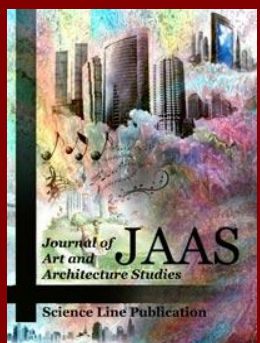
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