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# *Pseudopolydora kemp*

A tube-dwelling sedentary polychaete worm

Phylum: Annelida  
Class: Polychaeta  
Order: Canalpalpita, Spionida  
Family: Spionidae

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**Taxonomy:** *Pseudopolydora kemp* was described by Southern in 1921 from a brackish water lake in India and subsequently found in Japan, for which the subspecies *P. kemp japonica* was later designated by Imajima and Hartman (1964). When this species was found in California, another subspecies was designated (*P. kemp californica*) (Light 1969). However, after re-examining the type specimens of *P. kemp californica*, Blake and Woodwick (1975) determined that the subspecific designations were not necessary and, instead, *P. kemp*, was likely introduced to California from Japan (Carlton 1975; Blake and Woodwick 1975; Light 1978; Cohen and Carlton 1995). Although the species which occurs in Oregon is currently referred to as *P. kemp*, developmental differences suggest that this species is not the same as those from India and Japan (Blake and Ruff 2007).

## Description

**Size:** Individuals up to 28 mm in length (Blake 1975). Our specimens (from Coos Bay) are 16 mm in length and 1.5 mm in width, with nearly 40 segments. Average specimens are 12 mm in length, with 50 body segments (Light 1978).

**Color:** Pigmentation is variable (Light 1978), but typically pale, with transverse intersegmental rows of black spots anteriorly on most specimens (sp. *kemp*, Blake 1975) (Fig. 3).

**General Morphology:** Body thickened anteriorly, becoming narrow posteriorly. No division of body into distinct sections. Fifth setiger only slightly modified (Fig. 4).

## Body:

**Anterior:** Prostomium rather blunt, with small bi-lobed lateral horns (Fig. 2). No caruncle, but with

occipital cirrus between palps (Fig. 2).

## Trunk:

**Posterior:** Pygidium cup shaped, flaring and with two dorsal projections or processes (Fig. 4).

**Parapodia:** Biramous. Anterior noto- and neurosetae include several kinds of capillary and limbate spines (Figs. 5a and b). Notopodial post-setal lobes on setigers 2–5 (Fig. 3). Neuropodial lobes reduced at setiger eight, when they become tori, with hooded hooks.

**Setae (chaetae):** Modification on setiger five consists of a special J-shaped double row of falcigers (Fig. 5a) (sp. *kemp*, Light 1978), in addition to typical bilimbate setae (Fig. 5b). Setiger one with neurosetal fascicle only, no notosetae (Figs. 2, 3). Posterior neurosetae (from setiger eight) are bidentate hooded hooks in row of 18–20 (Fig. 5c) (genus *Pseudopolydora*, Light 1978).

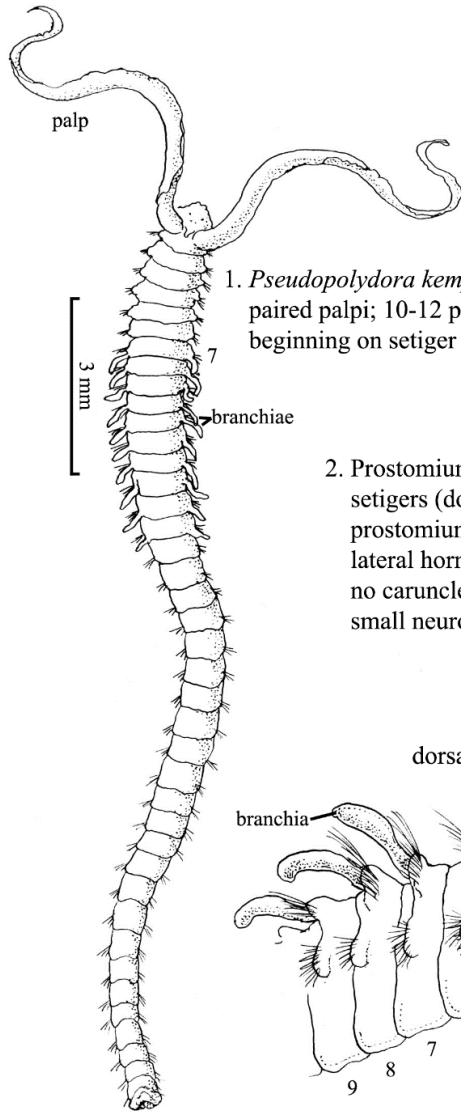
**Eyes/Eyespots:** Four small eyes, an outer pair anterior and darker with inner pair subdermal, close together and between palps (Fig. 2).

**Anterior Appendages:** Anterior with small bi-lobed lateral horns and two conspicuous palps each about 1/3 body length (Fig. 1).

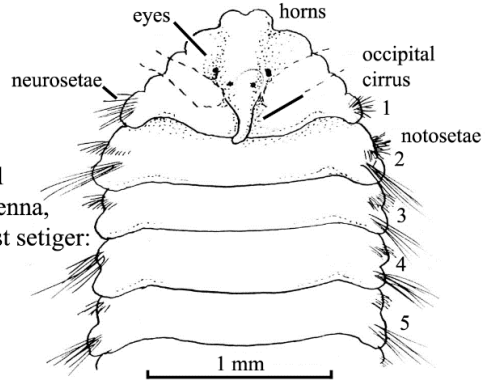
**Branchiae:** Present on 15–25 segments, beginning on setiger seven (Light 1978) (Figs. 1, 3).

**Burrow/Tube:** Tube mucoid and animal within is completely hidden, except for extended palps.

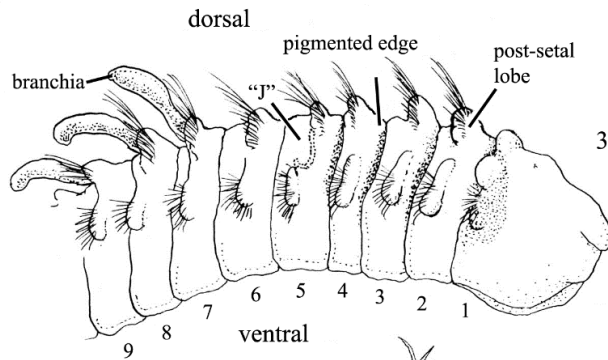
# *Pseudopolydora kemp*



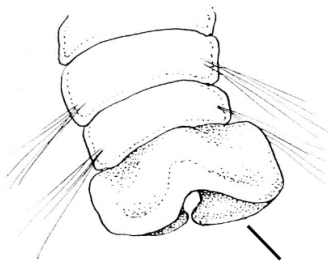
1. *Pseudopolydora kemp* (L:16mm) x10:  
paired palpi; 10-12 pairs branchiae,  
beginning on setiger 7.



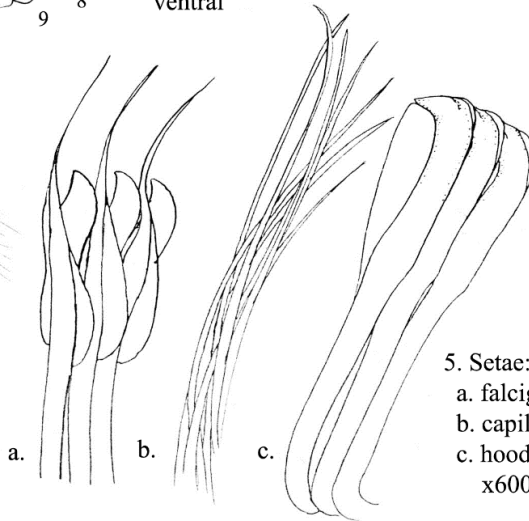
2. Prostomium and anterior  
setigers (dorsal view) x30:  
prostomium bilobed, small  
lateral horns; occipital antenna,  
no caruncle; four eyes; first setiger:  
small neurosetae only.



3. Anterior (lateral view):  
5th setiger with J-shaped  
double row of falcigers;  
pigmented setment  
edges; branchiae begin on  
setiger 7; post-setal lobe  
on setigers 2-5.



4. Pygidium (ventral view) x60:  
cup-shaped, 2 dorsal processes.



5. Setae:  
a. falcigers from 5 x32  
b. capillaries from setiger 5 x213  
c. hooded hooks from setiger 10  
x600.

**Pharynx:**

**Genitalia:**

**Nephridia:**

**Possible Misidentifications**

Spionidae can be distinguished by a pair of long prehensile grooved palps which arise from the posterior peristomium (Blake 1996). Two other polychaete families have long palps: the Magelonidae, with adhesive palps (not long and flowing) and with flattened spade-like prostomiums and the Chaetopteridae, which have palps, but their bodies are very obviously divided into three quite different regions, which is not the case in spionids. The similar family Cirratulidae, may also have a large pair of palps, but they have tentacular filaments, which are lacking in the spionids. Spionids also have hooded hooks in posterior segments, may or may not have prostomial appendages or branchiae, the prostomium is well developed and fused with peristomium, the pharynx is without jaws and the setae are mostly simple (Blake 1975). Often certain segments are highly modified and have special setae, for example prostomial horns are present in some genera. Spionid parapodia are biramous, with acicula (see *Leitoscoloplos pugettensis*) and sometimes have stout saber setae. There are 19 local spionid genera (Blake and Ruff 2007).

*Pseudopolydora* spionids can be distinguished from other genera by their unusual J-shaped row of hooks on setiger five (Fig. 3), and by their neuropodial hooded hooks, which begin on setiger eight. *Pseudopolydora* branchiae begin on setiger seven (Fauchald 1977).

*Pseudopolydora paucibranchiata* is the only other common Pacific Coast species in the genus *Pseudopolydora* (Blake and Ruff 2007). Unlike *P. kemp*, it has a rounded prostomium with no pigment stripes on the anterior segments. Branchiae are present from setiger seven,

but there are only 10–12 pairs (Light 1978). The major setae on setiger five are U- or J-shaped (Light 1978), but its pygidium is narrow and cup-like, lacking dorsal projections seen in *P. kemp*. *Pseudopolydora paucibranchiata* is small (4–6 mm, rarely more than 12 mm in length (Light 1978)) and its palps have yellow reflective spots (Blake 1975).

Other genera in this common estuarine family include *Boccardia*, *Polydora* and *Pygospio*. *Boccardia* have branchiae from setiger two and a strongly modified setiger five. *Polydora* also have a strongly modified fifth setiger, their branchiae begin on setiger six and they lack post-setal parapodial lobes (Hartman 1969). *Pygospio* (see *P. elegans*) have branchiae beginning posterior to setiger 10 and the fifth setiger is unmodified. Their tubes are papery and clear, to which fine sand grains adhere.

**Ecological Information**

**Range:** Type locality is a brackish water lake in India (Blake and Woodwick 1975). Although it is currently unknown if this species is widely distributed or consists of many cryptic species from distant locations, the current range includes locations in India, South Africa, Kurile Islands and the Pacific coast. California populations were likely introduced with oysters (*Crassostrea*) from Japan in the 1960s (Light 1978).

**Local Distribution:** Collection sites in Coos Bay include South Slough. Individuals also collected in the Columbia River estuary.

**Habitat:** Individuals inhabit mucoid tubes in sandy mud of bays and are often found outside beds of the mud shrimp *Callinassa*.

**Salinity:** Brackish to nearly fresh water with salinity ranging from 6.3–31.9. Collected at salinities of 30 in Coos Bay.

**Temperature:** 10–15 °C.

**Tidal Level:** Intertidal to shallow depths (Hartman 1969) and high intertidal (Coos Bay, South Slough in *Callianassa* beds).

**Associates:** The amphipod, *Eobrolgus spinosus* is often found within the tubes of *P. kemp*.

**Abundance:** South Slough, June abundance was measured in cores (15cm diameter x 13 cm depth) at three tidal heights. High intertidal core (1.1 m MLLW) produced 221 animals, mid intertidal (1 m MLLW) produced 4885 animals and low intertidal (0.9 m MLLW), 4113 animals (Posey 1985).

### Life-History Information

**Reproduction:** The reproduction and development of *P. kemp* has been described and varies with geographic location (Blake and Woodwick 1975; Strikrithnadas and Ramamoorthi 1977; Myohara 1979; Radashevskii 1985; Blake and Ruff 2007). Females brood eggs within capsules that are attached in long strings where the number of eggs per capsule (8–38 to 100–150) and number of capsules per string is highly variable (9–18 to 14–24). Eggs are 99–116  $\mu\text{m}$  (Blake and Arnofsky 1999). California populations have larvae that develop by ingesting nurse eggs, are released from their capsules at the 15-setiger stage and carry out a short pelagic period before settling into the benthos. Populations from India and the Sea of Japan, on the other hand, lack nurse cells, are released at the 3-setiger stage and undergo a long planktotrophic larval stage before settlement (Blake and Ruff 2007).

**Larva:** The larvae of *P. kemp* are recognizable by many adult characteristics including a slight modification of the fifth setiger, prominent parapodia, setae both simple and pennoned and arranged in U-shaped rows, and hooded hooks with a secondary tooth close to main fang (Crumrine 2001). Nectochaete larvae are thick and fusiform with metamorphosis occurring at 13–20

setiger stages or 1100–1800  $\mu\text{m}$  in diameter (Blake and Arnofsky 1999). Like developmental mode, larval pigment can vary between populations from California and India and the Sea of Japan (Blake and Ruff 2007).

**Juvenile:** Metamorphosis is marked by the transition of larval organs to juvenile structures. Anterior feeding palps, for example, which do not process food during larval stages are used for feeding in benthic juveniles and adults. Juvenile palps are long and reach setiger eight. Larval cilia are lost, anterior eyes are arranged as in adults, prostomium is bifurcate and larval setae are replaced by adult setae. Larval pigment is retained, but gradually lost in developing juveniles. The digestive tract is complete and the pygidium begins as a cup-shaped structure but eventually develops dorsal projections (Blake and Woodwick 1975, Fig. 19–22).

**Longevity:**

**Growth Rate:**

**Food:** Primarily a deposit feeder, but can shift to suspension feeding when water currents increase, by forming palps into helical shapes.

**Predators:** Fish and shorebirds.

**Behavior:** When lugworm *Abarenicola* sp. disturbs surface with castings, *Pseudopolydora* can move its tube location (Wilson 1981). Furthermore, the presence or smell of *Abarenicola pacifica* has been shown to reduce settlement of *P. kemp* juveniles (Woodin 1985).

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